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Awarded Grand Prize, Paris Exposition, 1900.

PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES,
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

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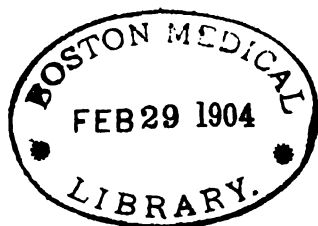
VOLUME II. JUNE, 1903.

SURGERY OF THE ABDOMEN, INCLUDING HERNIA—GYNECOLOGY—
DISEASES OF THE BLOOD AND DUCTLESS GLANDS. THE
HEMORRHAGIC DISEASES. METABOLIC
DISEASES—OPHTHALMOLOGY.



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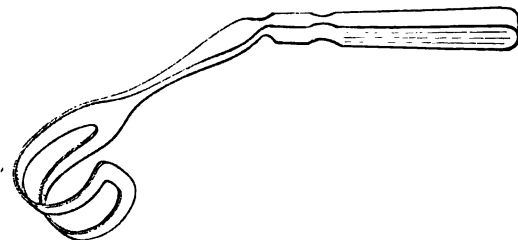


As evidence of the value of his gold-wire sutures and the instruments described he quotes his statistics, as follows:

"Before I devised these instrumental aids I had in every twenty cases to deplore one early or late suppuration and one relapse in every seventy cases. Now, however, operating in the same place and with the same assistants, out of one hundred and fifty consecutive operations for the radical cure of hernia, of which not a few were of a serious nature either from their size or from adhesions or from the age of the patient, I have uniformly obtained healing in eight days without any suppuration early or late and without a single relapse."

This is another example of how easy it is to attribute one's good or bad results to certain special features of the technique of operation.

FIG. 2.



Retractor (actual length about ten inches).

FIG. 3.



Spatula (actual length twelve inches).

Personally, I believe it is quite possible to explain the difference in his results without bringing in the question of sutures at all. If his assistants did not wear gloves it was evidently an advantage to use instruments, making it unnecessary for their fingers to come in contact with the wound. He further states that with the use of these new instruments and the sutures he had performed the radical operation for inguinal hernia within ten minutes.

The ability to perform the operation rapidly, without any bruising of the tissues, I believe to be an important factor in obtaining primary wound healing; but to prove that quite as good results, as Tansini reports, can be obtained without the use of either the instruments or the gold wire, I might quote my own statistics, in which gloves were worn by the assistants and operator, and chromicized kangaroo-tendon

was used for the buried sutures, catgut for the skin. I have had a series of 170 consecutive adult cases without suppuration.

O'Connor, senior medical officer at the British Hospital, Buenos Ayres, who has had a large experience in the operation for the radical cure of hernia, describes a new method¹ employed by him.

He states that he has performed 350 operations for the radical cure of hernia, in 140 of which Halsted's method was used, in 120 Kocher's, and in 90 Bassini's and other methods. He was obliged to abandon Halsted's operation owing to the too frequent occurrence of orchitis followed by abscess of the testis. He does not favor transplantation of the cord either by Bassini's or Halsted's method.

In regard to the use of buried, non-absorbable sutures he states that, after a personal experience covering over 1000 abdominal operations, he is very skeptical as to the tranquillity of the buried, non-absorbable sutures, especially silk, in the abdominal wall, and thinks the indiscriminate manner in which the latter is used in many hospitals extremely reprehensible. He believes it would be a very good rule "never to bury a non-absorbable stitch in a submuscular cavity where serum and blood are prone to collect and to corrupt." Although he has used Kocher's operation in 120 cases with only 6 per cent. of recurrences, he does not favor that method of dealing with the sac, and I quite agree with him in saying that this method of fixing the stump of the sac to the abdominal wall with or without inversion probably does not materially influence the cure or probability of recurrence.

The operation which he now employs consists, briefly, in opening the canal, as in Bassini's operation, high ligation of the sac, closure of the canal by means of what he terms "a circular submuscular suture," which is inserted by a curved hernia needle at one-half inch intervals. The four sutures pass from within outward through Gimbernat's ligament and the external oblique, the ends being retained outside the aponeurosis. In other words, the canal is closed without transplantation of the cord. The external and internal oblique are apparently sutured in one layer. The description is not very clear.

In view of O'Connor's attitude as regards buried, non-absorbable sutures, one is somewhat surprised at his statement that in his new method he uses strong fishing gut sutures. To my mind these are much more liable to give rise to trouble than either silk or silver wire, for I have seen them removed from a hernial wound three years and eight months after primary wound healing.

The method of closing the canal without transplantation of the cord is by no means new, and has been used at the Hospital for Ruptured

¹ *Lancet*, May 31, 1902, p. 1532.

and Crippled by Dr. Bull and myself in a number of cases since 1892. We have used kangaroo-tendon and sutured the canal in two layers rather than a single layer, bringing out the cord at the lower angle. The results of this method have been nearly as good as those of Bassini's typical method, although the number—less than 100—is not sufficiently great to permit of making a fair comparison. Dr. Bull has had a larger experience with this method than myself.

Strangulated Hernia in Infants. The most thorough and elaborate study of this subject that has yet been made is found in a contribution of Estor.¹ Estor gives the details of 3 personal cases operated upon in 1899, 1900, and 1901. In addition to these he has collected all the cases that he has been able to find reported in the literature up to the present date—225 in number—and these cases he has very carefully tabulated. In proof of the rarity of this condition he cites the statistics of Berger, Félizet, and others. In 10,000 cases of hernia observed by Berger, he found only 1 case of strangulated hernia in a male infant, aged fourteen months. Demme, in 515 cases of hernia in the infant, observed only 12 cases of strangulation, of which only 5 were operated upon.

At the Hospital Trousseau, Broca, in performing 950 radical cure operations, operated upon only 9 cases for strangulation. Félizet, in his book *About Hernia in Childhood*, reports only 3 kelotomies in 105 radical cure operations. König, in the course of a long practice in surgery, states that he operated only twice for strangulation in young infants. Estor himself, in 435 operations performed upon children less than fifteen years of age, performed 38 radical cures and 3 kelotomies. Estor cites the statistics of Stern, who examined the records of the children's hospitals in nine of the great clinics of Europe, and which show that out of a total of 138,741 infants treated in these hospitals there was not a single case of kelotomy.

As to the relative frequency of strangulation in infancy and adult life, Wimmer states the proportion as 1:62. The relative proportion is probably still less than this, since Frickhofer, who collected 1500 cases of strangulated hernia between 1818 and 1859, found only 14 cases of infants under two years, and only one of these was operated upon. The age was stated, however, in but 737 of the total number; this would give a proportion of 1 in 737 if we count only cases of kelotomy, or 14 in 737 if we include, as we should, all the cases. Stern, who has made a very extensive study of the subject, has worked out the proportion as 1 in 131.

As to the variety of hernia that is most frequently strangulated Estor's statistics show that the inguinal form in the male far exceeds

¹ *Revue de Chir.*, 1902, Nos. iii., v., vi.

all other varieties. Only 2 cases of strangulated femoral hernia were found, 14 strangulated umbilical, 205 male inguinal.

Estor's statistics throw important light upon the question as to the period in which strangulation is most likely to occur. In 120 cases it occurred within the first six months, and in 49 cases the second six months of the first year. The maximum frequency was found in the first month. It is interesting to observe that in the 14 strangulated umbilical herniæ strangulation occurred nine times in infants less than one week old.

Estor's statistics further show a great preponderance of strangulated hernia in infants in the male, only 5 of the 225 cases reported occurring in the female, making the condition forty-six times more common in the male than in the female. In 1 of these 5 cases occurring in the female the variety was not noted; of the other 4 cases 2 were femoral herniæ.

Whether strangulation occurred in pre-existing hernia is a point of some interest. In only 65 cases requisite data for determining this were available. In 55 of these cases a hernia had existed prior to strangulation; ten times no hernia had been noticed before.

Estor states that in the great majority of the collected cases the cause of strangulation was found at the neck of the sac. Yet he states that in 21 cases furnishing 19 cures and 2 deaths strangulation was reduced without opening the sac, showing that the strangulation must have been due to a constriction of the aponeurotic ring.

In attributing the cause of strangulation almost entirely to the neck of the sac, Estor has simply followed the opinions of nearly all the writers on strangulated hernia in infants. I have long believed this opinion to be erroneous, my reasons being that in infants and even children up to the age of ten or twelve years the sac is very thin and easily stretched, making it quite improbable that it could furnish sufficient resistance to cause strangulation of a loop of intestine. In my own experience, covering 10 cases of strangulated hernia in infants operated upon under the age of two years, the strangulation was in no case due to the neck of the sac, but always to the small external ring made up of the unyielding fibres of the aponeurosis of the external oblique. The fact that strangulation has been attributed to the neck of the sac by so many and for so long a time, is due, I think, largely to the simple methods of operation used in the early cases. The constriction was cut with a kelotomy knife without any extensive dissection or systematic attempt to perform a radical cure. All my own cases have been operated upon by Bassini's method, and after splitting up the aponeurosis of the external oblique I have never had any difficulty in reducing the bowel without cutting the neck of the sac.

CONTENTS OF THE SAC. In 104 cases in which the contents were noted the small intestine was found in 53, sigmoid 1, cæcum 5 times, appendix 6, cæcum and appendix 11, cæcum and colon 1, cæcum and small intestine 6, appendix and small intestine 4; small intestine, cæcum, and appendix 9; omentum with intestine 4, ovary alone 2, ovaries with small intestine 2.

It is a striking fact that in these 104 cases the cæcum or appendix were found in the hernial sac in 42 cases.

The great frequency with which the cæcum is found in hernia in infants Estor states is due to the fact that in infants the cæcum occupies a position below the iliac spine in 72 per cent. of the cases, while in adults it occupies this position only in 9.7 per cent.

In regard to the prognosis Estor states that the highest authorities in surgery have always regarded strangulation in infants as less grave than in adults. While admitting this relative benignity he believes that it has been exaggerated.

The mortality of strangulated hernia in the adult has averaged, according to the different statistics, from 44.7 per cent. (Southam) to 12.7 per cent. (König). Estor estimates the average mortality at 25.94 per cent. in adults. The mortality of strangulated hernia in infants, based upon his own large statistics, is 23 per cent., which differs very little from the adult mortality.

Separating the cases into the preantiseptic and antiseptic period the cases operated upon between 1868 and 1885 show an infant mortality of 32 per cent., while the cases operated upon from 1885 to 1901 give the low mortality of 11.4 per cent. The mortality for strangulated hernia in adults during the antiseptic period has been estimated by Carl Stern at 18.9 per cent.

Of the series of cases reported by Estor 82 cases operated upon during the first three months show a mortality of 31 per cent.; during the second three months, 24 per cent.; during the third three months, 29 per cent. In 34 cases operated upon from within the tenth to the fifteenth months the mortality was only 5.8 per cent. In 15 cases operated upon between the sixteenth and eighteenth month there was no mortality. The mortality of the cases operated upon from the eighteenth to the twenty-fourth month was 21 per cent.

As to the question of removing or replacing the appendix when found in the sac, Estor believes that if the patient's condition will permit of prolonging the operation it is wise to remove it; otherwise not.

This is the rule that I have followed in my own cases.

DURATION OF STRANGULATION. At first thought one would suppose that a good prognosis would depend largely upon the duration of

the strangulation. The facts do not seem to confirm this supposition, however. The lowest mortality, viz., 8.5 per cent., occurred in the cases in which the strangulation had existed from forty-eight to sixty hours. The mortality of those operated upon within twelve hours after strangulation was 10 per cent.

It is only after three and one-half to four days that sloughing is apt to occur. The mortality at this time is 50 per cent.

The mortality in my own 10 cases was 1 death in a child six weeks old, nearly moribund at the time of operation, the strangulation having existed three days.

My youngest case was an infant, thirteen days old ; the strangulation had existed fourteen hours. An uninterrupted recovery followed operation.

Results from Bassini's Operation. In connection with Bassini's operation for the radical cure of inguinal hernia, Matanowitsch¹ presents a most interesting paper covering the results obtained with this method at the Heidelberg Clinic from January 1, 1895, to January 1, 1900. He reports 106 cases in which 126 operations were performed. Bassini's method was employed in all but 6 of the double herniæ, in which it was used on one side only, the other side being operated upon (by way of comparison) by Czerny's method four times, Kocher's twice ; 12 of these cases, with 14 operations (13 Bassini, 1 Czerny), could not be traced to final result. Deducting these the material that remains comprises 94 cases with 76 single and 18 double herniæ, or a total of 112 herniæ, of which 107 were operated upon by Bassini's, 3 by Czerny's, and 2 by Kocher's method.

As regards the sex of the patients, it is stated that 103 were men and 3 women. The ages ranged between one and sixty-six years. It should be mentioned, however, that for hernia in children Czerny's method is used in the great majority of cases, and these, of course, are not considered here.

In 12 cases the hernia was incarcerated ; in 10 it had become irreducible on account of adhesions ; 13 were congenital.

In the latter the peripheral portion of the hernial sac was either inverted according to Winkelmann's method of operation for hydrocele, or extirpated *in toto*, as in Bergmann's operation for hydrocele, as practised by Lucas Championnière. In 20 cases the hernia had existed less than a year ; in 66, from one to ten years ; in 17, from ten to twenty years ; in 18, over twenty years. The greatest number of herniæ were acquired from the twentieth to the thirtieth year of age. Twenty patients gave a history of direct or indirect trauma ; in 8 pre-

¹ Beiträge z. klin. Chirurgie, 1902, xxxiv., p. 450.

disposition to hernia had been determined, and in 12 hereditary tendency.

Regarding the size of the herniæ it is stated that 13 were large (from the size of a double fist to a child's head); 59 medium-sized (hen's egg to fist); 18 were very small, interstitial herniæ, and the remainder were from the size of a pigeon's egg to that of a walnut.

As to wound healing complications were observed in 25 cases. In 13 hæmatomata were the cause of trouble, in 12 fascia necrosis and stitch-canal suppuration. Healing *per secundum* in the true sense of the word was, however, noticed in but 13 cases, and counting these only the percentage of suppurations was 10.

Although considered unnecessary by Bassini, Matanowitsch states that they always advise their patients to wear a truss for a month or longer, according to the nature of the case.

With reference to permanent results, the point of greatest moment in estimating the value of operation for hernia, Matanowitsch gives the following data:

The time of observance was as follows: In 9 cases, six years; in 14 cases, five years; in 19 cases, four years; in 26 cases, three years; in 38 cases, two years. Three true relapses were found, giving a percentage of 2.8. Adding 10 cases published by Simon without relapse this would give a series of 117 herniæ with 3 relapses (2.5 per cent.).

By way of comparison as to the results of operations done by Bassini's and Kocher's method, respectively, Matanowitsch publishes a table which will be found of interest:

Bassini (according to Franz), 593 cases with 28 relapses; Rotter, 66 cases with 1 relapse; Coley, 655 cases with 6 relapses—my present statistics show 959 Bassini operations with 9 relapses; Carle (Galeazzi), 601 cases with 36 relapses; Czerny's clinic, 117 cases with 3 relapses, or a total of 2032 cases with 74 relapses (3.6 per cent.) after Bassini's method.

Cases operated upon by Kocher's method: Lebensohn, 111 cases with 4 relapses; Hirschkopf, 125 cases with 1 relapse; Trzebizky, 53 cases with 2 relapses; Carle (Galeazzi), 239 cases with 12 relapses, giving a total of 528 cases with 19 relapses (3.8 per cent.).

From these figures it appears that the percentage of relapses is about the same in both methods, although it should be stated that Lebensohn's cases were not traced for a sufficiently long period of time to make his statistics of great value for purposes of comparison; the same is true of Hirschkopf's statistics, which include femoral hernia.

We do not agree with Matanowitsch as to the opinion that Czerny's radical operation for hernia is superior in small children. That Bassini's method is quite as well adapted to children as adults, in

simple as well as complicated cases, our statistics—more than 1000 cases—at the Hospital for Ruptured and Crippled conclusively prove.

His statement that it is advisable not to loosen the aponeurosis too freely in order to avoid necrosis of the aponeurosis is, I think, open to question. I have always advocated very free dissection of the aponeurosis from the underlying muscle in order to secure better apposition of the internal oblique to Poupart's ligament, and have never yet seen any harm in results. The operation cannot, I think, be properly performed without free dissection of the aponeurosis.

Dr. Severin Goldner,¹ of the I. Surgical University Clinic, Vienna (Hochenegg), publishes an exhaustive report covering 800 radical operations, according to Bassini, with late results. These operations were done between March, 1895, and December, 1899, and only such cases are considered as permanently cured as have remained free from relapse upward of two years after operation. Seven-eighths of all the cases traced were examined by physicians, it having been found that reports of patients are not always reliable.

As regards the question of what constitutes a relapse after a radical operation, Goldner cites the following conditions:

1. If a new hernia protrudes through the external inguinal ring.
2. If there is a distinct defect in the cicatrix of the muscle, through which a small hernial sac protrudes on coughing.
3. If a crural hernia has developed.

Among his personal clinical examinations Goldner found 24 relapses; 9 of these were true relapses; 7 presented small, circumscribed defects in the upper wound angle of the cicatrix, with impulse on coughing; in 5 the same conditions were present in the lower wound angle; 1 was a ventral hernia, and in 2 cases a crural hernia had developed, while the result of the inguinal hernia was perfect.

In 466 cases examined from two to six and one-half years after operation, 35 relapses were found (7.5 per cent.). Omitting from this number the cases in which a slight protrusion was noticed in the upper wound angle of the cicatrix and those in which a crural hernia appeared after the radical operation—as is the custom of most operators—the figures would be 23 in 466 cases, or 4.9 per cent. Of 13 patients that submitted to operation for relapse, 6 presented a true hernia; 2, defects in the upper wound angle; 2, defects in the lower wound angle, and 1 a direct hernia. The findings at these operations showed that it is less important to prevent funnel formation of the peritoneal stump than to avoid the formation of a defect in the cicatrix, into which the peritoneum may slip. He further states that it is not the transplantation

¹ Archiv f. klin. Chir., vol. lxxviii., No. 1.

of the cord but its exact isolation that is of paramount importance. He cites several cases in which the cord was not transplanted and in which no relapse developed. In the cases where a relapse takes place in the shape of a circumscribed defect in the cicatrix, he thinks one should confine one's efforts to the exact closing of such defect.

Goldner's report comprises 701 radical operations for free inguinal herniæ in men, 71 in women, 18 Bassini operations for incarcerated hernia, and 14 radical operations for recurrent hernia, giving a total of 804 radical operations on 473 patients (423 men and 50 women). The majority of the operations were performed on patients between twenty and thirty years of age, the youngest being eight months, the oldest fifty-nine years.

While in 1895 only 72 radical operations were performed, the number of operations rose to 238 in 1899.

Of 434 cases that were found free from relapse from two to six and one-half years after operation, 381 were non-incarcerated herniæ in men, 37 in women; 12 incarcerated herniæ, and 4 that had been operated upon for relapse.

As regards late results in children, Goldner's table shows 58 cases examined with 1 slight relapse (1.7 per cent.). The hernia in this case had been very large.

Bassini's operation for the radical cure of hernia is, therefore, warmly recommended in children, the only drawback being the difficulty in keeping these little patients clean and thus free from infection. At the Hospital for Ruptured and Crippled in New York there have been over 1000 operations for hernia in children between the ages of four and fourteen years since 1891. The percentage of primary wound healing has been equal to that in adults, and the permanent results have been even better. We rarely advise operation under the age of four years.

As to contraindications to radical operation, Goldner mentions the following:

1. The age of the patient. Patients above sixty with a tendency to bronchitis and in whom, owing to the atrophied condition of the musculature, there is little prospect as to a good permanent result, should not be subjected to operation.

2. The presence of a heart defect, extensive destruction of the lungs, kidney disease, or diabetes.

3. Operation is but exceptionally done in children under three years of age, inasmuch as a cure is frequently effected by truss. (This is the rule that we have always advised at the Hospital for Ruptured and Crippled.)

Operation is further contraindicated in cases of eventration hernia in individuals upward of forty years of age.

As to anæsthesia, Goldner states that while during the period covered by his report general anæsthesia was employed in the great majority of operations, Schleich's local anæsthesia has been used almost exclusively in all cases of inguinal hernia during 1899 and 1900—in all, 130 cases. Goldner calls attention to the one fault of the method, namely, that the most important step of Bassini's operation, the placing of the muscle sutures, can frequently not be accomplished without pain to the patient, and this may sometimes cause a great deal of trouble and annoyance. Nevertheless, he is greatly in favor of the method and expresses his conviction that as soon as it becomes more generally known that narcosis is by no means as harmless and free from danger as is generally believed, local anæsthesia will receive the consideration and place it deserves. I have never operated for hernia under cocaine anæsthesia, and I do not believe that in ordinary cases it is indicated. In an uncomplicated case the operation can be performed in ten to fifteen minutes under ether, and far more satisfactory, I believe, than under cocaine.

Goldner points out that the radical operation for inguinal hernia may, under certain conditions, favor the development of a crural hernia, and refers to a modification of Bassini's suture in the radical operation for inguinal hernia in the female by Föderl, Narath, and others, the purpose of which is to simultaneously close the inguinal and crural openings. The internal oblique and transversalis muscles are sutured to Poupart's ligament and the periosteum of the horizontal ramus of the pubis. This modification was employed at the Vienna Clinic in 23 cases of inguinal hernia in the female; 14 of these were later examined, and only one recurrence was found. This modification I believe to be entirely unnecessary, in proof of which I would cite my own series of 190 cases of inguinal hernia in the female without a single relapse.

Classifying the 800 radical operations for hernia according to size, Goldner states as follows: 4 were eventration herniæ, 10 were the size of a child's head, 40 were the size of a fist, 48 were the size of a goose-egg, 127 were the size of a hen's egg, 82 were the size of a walnut, the remainder being either interstitial inguinal herniæ or cases with extended inguinal ring and distinct impulse on coughing.

The contents of the sac in the non-incarcerated cases were as follows: Adherent omentum, 107 cases; small intestine, 25 cases; large intestine, 8 cases; small and large intestines, 3 cases; omentum and large intestine, 6 cases; omentum and small intestine, 12 cases; large intestine, small intestine, and bladder, 1 case; large and small intestines and omentum, 2 cases. In 1 case the resected portion weighed 800 grammes without having caused any complications.

In the series reported by Goldner 12 were direct herniæ, in 5 instances bilateral, and in 2 cases a direct and oblique hernia existed together; 8 of these were traced, with one relapse, which would seem to show, Goldner states, that the prognosis of radical operation for direct hernia is by no means as unfavorable as is generally believed.

He further reports 27 cases in which cryptorchidism and hernia furnished the indication for operation. In 10 of these orchidopexy was performed, only 3 of which could be traced. In 2 the testicle was found in the scrotum; in the third it was located in the inguinal region.

In 5 cases the testicle was transplanted into the scrotum; in 3 into the abdomen; once subserously; 6 times it was not transplanted.

With regard to the postoperative course of operations for the radical cure of inguinal hernia, Goldner states that every one with any considerable experience will have noticed that, despite the most careful observation of all rules of asepsis, the wound healing in these cases is by no means as ideal as, for example, in laparotomies, and while the statistics published within the last ten years show that there has been some improvement much yet remains to be done. The reports of some of the leading writers on the subject give the following percentages of postoperative suppuration:

Haidenthaler (1890), (Billroth's clinic), 49.3 per cent.; MacEwen (1890), 17 per cent.; Escher (1892), 32 per cent.; Wölfler (1892), 14 per cent.; Nicoladoni (1893), 15 per cent.; Büngner (1894), 21.2 per cent.; Ludwig (1897), 8.9 per cent.; Slainer (1898), 14 per cent.; Schnitzler (1898), 13 per cent.; Kocher (1898), in those operated upon according to his latest method, 6.8 per cent.; Franz (1899), (v. Eiselsberg's clinic), 13 per cent.

As one of the possible technical reasons for these inferior results as regards wound healing, Goldner mentions the suture material—*i. e.*, catgut—adding that conditions have considerably improved at the Vienna Clinic since the use of catgut for the fascia sutures was abandoned. Goldner shows that in 772 radical operations for non-incarcerated hernia superficial suppuration occurred in 80, deep suppuration in 17 cases, or, expressed in percentage, superficial suppuration occurred in 12.5 per cent., deep suppuration in 2.2 per cent. of the cases. It should be stated, however, that while in 1895 suppuration was observed in 18 per cent., in 1899 it was seen in only 5.8 per cent. of the cases.

With reference to the generally conceded importance of obtaining primary union after Bassini's operation for inguinal hernia, Goldner does not believe that it is the only decisive factor in ensuring a good, permanent result, for in 25 of the 35 recurrences wound healing had been entirely without reaction.

As regards mortality, Goldner reports 3 deaths in his series of 800

—1 occurring in narcosis, the other 2 eleven and fourteen days, respectively, after operation, 1 due to pulmonary embolism, the other to embolism associated with varicosities in the subcutaneous connective tissue of right thigh with formation of thrombi in the varices.

In regard to the advantages of Bassini's operation over the old herniotomies, Goldner enumerates the various points emphasized by Franz:

1. The finding of the hernial sac is accomplished in a much simpler and safer manner.

2. The incarceration is generally loosened already during the process of isolating the neck of the sac, but can certainly be done under the exact guidance of the eye.

3. Reposition of the protruding intestine is accomplished in a much simpler and less harmful way. The danger of a false reduction into the subserous space seems excluded.

Goldner reports only 17 cases of incarcerated hernia treated by Bassini's operation. Of these 13 were traced, with 1 relapse, or 7.6 per cent.

In 7 of the incarcerated cases the sac was found to contain an incarcerated loop of intestine; in 5 of these it could be reduced, while in the other 2 gangrene had already set in and resection had to be done. The two ends of intestine were united by means of Murphy's button and lateral apposition. After replacing the sutured intestine, Bassini's operation was added.

These statistics, next to those of Carle's clinic, published by Galeazzi and reported in *PROGRESSIVE MEDICINE* two years ago, are the most complete results after Bassini's operation that we have yet had.

We are somewhat surprised at the large percentage of suppurations in patients operated upon since 1895, and we cannot agree with Goldner that the reason for the poor wound healing should be ascribed to catgut unless it be that the catgut was very imperfectly sterilized. As I have already stated, I have used catgut for ligatures and skin sutures and kangaroo-tendon for the buried sutures in all cases since 1891. Even prior to 1898, before the use of rubber gloves, my percentage of suppuration was less than 5 per cent. Since that time I have had one series of 200 cases with only 1 case of suppuration, and this includes superficial as well as deep. These splendid final results at the Vienna Clinic still further confirm the opinion we have long entertained, that Bassini's method is superior to all others for the radical cure of inguinal hernia.

Personal Results. From August, 1891, to April, 1903, I have operated upon 1066 cases of inguinal and femoral herniæ with 2 deaths. Of these, 200 were inguinal herniæ in the female, in patients ranging

in age between three years and seventy years. In this series there was no mortality, and not a single relapse has been observed, although all but 14 cases have been traced.

In 67 cases of femoral hernia there was no mortality and but 1 relapse, the only case in which suppuration occurred. The relapse in this case is nothing more than an impulse, and does not require a truss six years after operation.

Seven hundred and ninety-nine cases were inguinal hernia in the male. In this group there were 2 deaths—1 in a child, aged eight years, from ether pneumonia; the other in a complicated case of large irreducible omentum which was returned to the abdomen. The patient developed intestinal obstruction, apparently from volvulus, and died on the sixth day. The relapses number 14. An analysis of the relapsed cases shows that the Bassini method was used in only 9 cases, and that the cord was not transplanted in the remaining 6.

Suppuration occurred in 4 of the relapsed cases; 1 was a large direct inguinal hernia with very weak and thin abdominal muscles in a man aged fifty-seven years; 1 was a cæcal hernia with irreducible omentum, and the operation unusually difficult by reason of numerous adhesions caused by fifteen treatments by an "injection method" he had recently tried; 1 was an inguino-perineal hernia of large size. In 1 case the patient had remained well for a number of years in spite of very severe strain, and the rupture finally recurred after a severe attack of typhoid fever, during which he lost seventy pounds in weight. One was a case of large irreducible omentum, and the relapse is little more than an exaggerated impulse; 1 occurred immediately after a severe kick in a fight, after having remained well for more than two years.

Five of the patients were operated upon during the first year, when my technique was naturally inferior. In 2 of these cases silk was used, and later sinuses developed and the sutures were extruded. I have never used silk as a buried suture for hernia except in 3 cases, and in 2 relapses occurred. In 1 case, operated upon on August 1, 1891, a double inguinal, I used Bassini's method on one side and closed the canal without transplanting the cord on the other. The Bassini side is sound, more than eleven years after operation; the other side relapsed nine years after operation, and I again operated by Bassini's method.

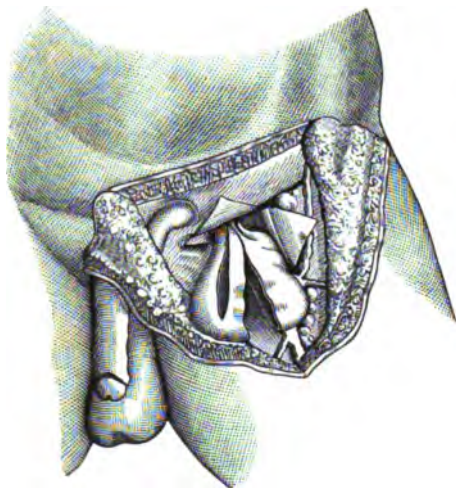
Femoral Hernia. A new method for the radical cure of femoral hernia has recently been described by Dr. J. Henderson Nicoll.¹ Nicoll believes that while the less severe forms of femoral hernia may be cured by the simpler methods in vogue, the more severe forms are unusually

¹ British Medical Journal, November 8, 1902, p. 1521.

difficult to cure. He states that the sense of the magnitude of the difficulty to be overcome in the radical cure of femoral hernia has been so weighty as to cause surgeons to propose most unique operative methods, such as plugging the canal with glass balls, wire gauze, transplanted costal cartilage, flaps of bone and periosteum.

The method proposed by Nicoll was originally adopted only in the more severe and unfavorable cases, but he now uses it in the simpler forms of femoral hernia as well. The distinctive features are: Using the sac to form a buttress on the abdominal aspect of the ring, similar to the procedure advocated by MacEwen in inguinal hernia; closing of the femoral ring by means of fixing the anterior boundary of the canal, Poupert's ligament, to the posterior, the ramus of the os pubis, by drilling through the latter. The accompanying cuts show the

FIG. 4.



Sac emptied, detached from surrounding parts, including external aspect of abdominal wall for one inch around femoral ring; split longitudinally, and one-half incised for passage of the other.

various steps of the operation. The sac is emptied of its contents, bisected longitudinally from fundus of neck, an aperture is made in one-half near the neck of the sac, which permits of the interlocking of the halves by putting one-half through the aperture of the other. The whole sac is then reduced through the femoral ring into the extraperitoneal space, forming a buttress at the orifice of the canal. The femoral ring is then closed as follows:

1. An incision (bone-deep) is carried from the femoral vein along the pubic ramus to the region of the pubic spine. This divided the pubic portion of the fascia lata, the origin of the pectineus, and the periosteum.

Its length depends upon the extent to which the femoral vein has been displaced outward by the presence of the hernia, and will vary from one to one and one-half inches.

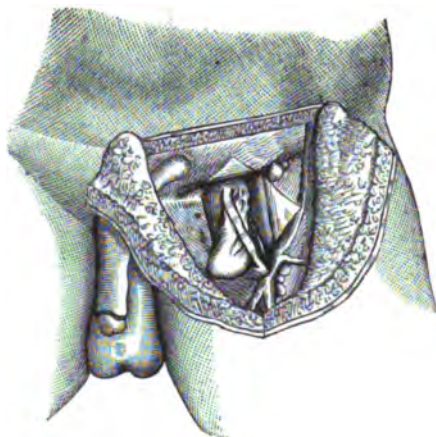
2. The periosteum is detached to a limited extent, and retracted.

3. Near the upper edge of the bone one or two drill-holes are made one-half inch apart (if two) by means of an ordinary drill or punch.

4. A loop of stout catgut or other absorbable ligature is passed through one of the apertures, best, by threading it in the eye of the bone drill or in the eye of an ordinary surgical probe. He employs a special probe in which the eye is small and placed very near the extremity of the handle. With such a probe, he states, the operation is simplest.

5. The loop of the ligature is then divided, one end threaded in a large surgical needle, and passed as a mattress suture through Poupart's

FIG. 5.



Sac ready for reduction, with halves interlocked. (The situation of the aperture in the sac in Figs. 4 and 5, and the relative positions of the two halves of the sac in Fig. 4, are not, in the interests of semidiagrammatic clearness in the drawing, quite those of actual practice.)

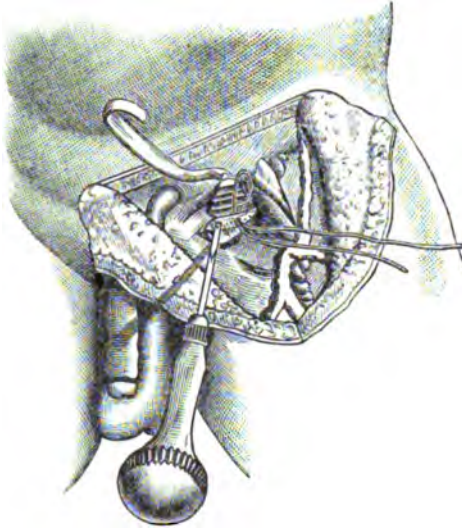
ligament; it is then unthreaded. This is repeated with the second end, which is carried through Poupart's ligament at a higher level, the deep epigastric artery to the outer side, and, in male patients, the spermatic cord above, being carefully avoided. In very large herniæ the loops, instead of being placed the one directly above the level of the other, may be made to diverge in the ligament so as to "gather in" the margin of the aperture.

6. By means of the probe into the eye of which the ends are threaded both are withdrawn through the second drill-hole in the bone.

7. The ends of each loop are tied separately over the front of the bone, thus bringing Poupart's ligament down to the postero-superior

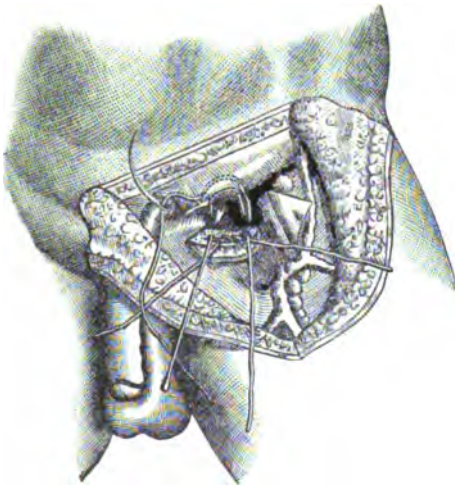
surface of the bone and fixing it firmly in contact with that surface, and absolutely closing the femoral ring as far as may be desired, due regard

FIG. 6.



Closure of ring ; drilling of bone ; looped catgut suture passed through first drill-hole.

FIG. 7.



Closure of ring ; placing of the loops in Poupart's ligament, and return of the ends through second drill-hole. (One loop tied loosely to indicate action in pulling Poupart's ligament down to postero-superior aspect of ramus of os pubis.)

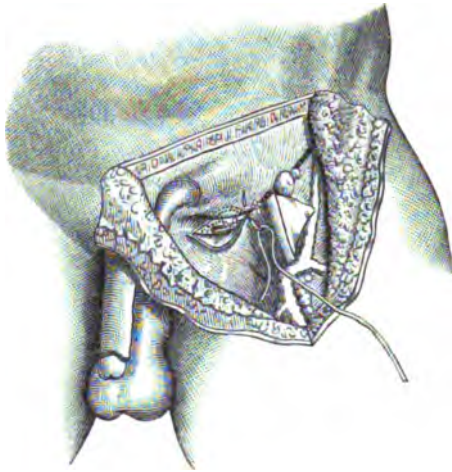
being had to the proximity of the femoral vein. The degree of occlusion is regulated by the position of the sutures in Poupart's ligament, not by the tension with which they are tied, which latter does not vary.

8. To make the closure doubly secure the operation may be completed by uniting, by interrupted catgut sutures, the detached margin of the pectineal origin and the pubic portion of the fascia lata to the "anchored" Poupart's ligament.

Nicoll states that the absence of all sutures in the sac has three advantages :

1. The obvious saving of time.
2. Avoidance of the recognized risk of strangulation and consequent sloughing of the tied-up sac in the grasp of the ligature.
3. The facility with which the entire sac may be placed within the abdomen.

FIG. 8.



Closure of ring ; bone sutures tied ; completion of closure by suture of fascia lata and pectineus to the fixed Poupart's ligament.

I must confess it is difficult to understand how this method of treating the sac can be any more rapidly performed than the old method of ligature after freeing the sac well beyond the neck. If the sac has been properly freed and tied off well beyond the neck, I believe that the risk of strangulation and sloughing of the sac is far less than the danger of necrosis of the poorly nourished sac that has been returned into the abdominal cavity.

I have personally operated upon sixty-seven cases of femoral hernia, in all of which the sac has been ligated in the manner I have described, and in no case has any trouble resulted.

In regard to the method of closing the femoral opening, as proposed by Nicoll, I believe it would be a very excellent one, provided the cases could not be cured by the simpler method of purse-string suture or Bassini's method of closure. I have myself used the purse-string

suture in fifty-one cases of femoral hernia without a single relapse; Bassini's method sixteen times, with one relapse, the failure in this case being probably due to suppuration. These cases have not been selected cases. I never refused to operate on a single case on account of the size of the hernia. In a good many of the cases in which the purse-string suture was used the opening was very large, and yet perfect closure of the canal was easily secured and the patients have remained well more than three years.

I believe Nicoll's operation is decidedly superior to the operation recently described by Roux, which consists in bringing Poupert's ligament down upon the pubic bone by means of a wire nail, which is allowed to remain *in situ* permanently.

Umbilical Hernia. Busse reports 22 cases of umbilical hernia that presented themselves for treatment at the Königsberg Surgical Clinic and the private clinic of Prof. v. Eiselberg between April 1, 1896, and April 1, 1901. Two of these occurred in infants, 1 being a hernia of the umbilical cord. Of the 20 herniæ in adults, 4 were incarcerated; of the 16 cases not incarcerated, 5 were reducible. Seventeen of the adult cases were women.

As regards age, the majority of the female patients were between thirty and thirty-nine at the time the rupture was noticed; 2 of the men were between forty and fifty; the third was sixty-four years old.

Most often the hernia had existed for five years prior to operation; in 3 cases eight years. In the incarcerated cases the hernia had existed in 1 case eight years, in another twenty years, in a third forty-six years, and in the 2 remaining two days. Most of the cases had been reducible in the beginning.

More or less adherent omentum alone was contained in the sac in 9 of the non-incarcerated cases. In the incarcerated cases the sac contained adherent omentum plus small intestine in 3 cases; in 1 case adherent large intestine.

Wound healing proceeded entirely satisfactorily in all cases.

There were two deaths, but one, Busse thinks, should not be counted, inasmuch as in this case perforative gangrene was already present at the time of operation and there was really no hope of saving the patient. The other death occurred very suddenly in a patient in whom recovery had been progressing without interruption for two weeks. Death was thought to have been due to embolism of the lung. Counting this death as due to operation, the mortality in the non-incarcerated cases would be 6.6 per cent. In the four cases of incarcerated hernia there was one death (25 per cent.). Thus the total mortality was 10.5 per cent.

All suture wounds healed by primary union, and the patients generally left the hospital at the end of twenty-five days.

It was possible to trace 15 of the cases, but 1 having since died of some other disease, only 14 can be used in forming an opinion as to the permanent results. Eight of these (57 per cent.) have remained without relapse, while in the other 6 a relapse has been noticed. Four of the patients wear an abdominal belt for safety's sake. Three of the patients claimed that small fistulæ had occurred in the course of time, owing to suppuration caused by the silk sutures.

Busse divides the cases, according to size, into three groups: 1. Four cases of large hernia (from a double fist to a man's head in size), three of which relapsed (75 per cent.). 2. Four cases of medium-sized hernia (from a small apple to a goose-egg) with two relapses (50 per cent.). 3. Four cases of small hernia, from the size of a hazelnut to that of a walnut, without relapse.

These figures demonstrate the great importance of early radical operation, it being evident that the chances of a permanent cure decreased with the size of the hernia. Busse states that it is only in small umbilical herniæ that a definite cure can be guaranteed. This is the opinion that Dr. Bull and myself have long held.

The difficulties attending successful operation for umbilical hernia of large size have been long recognized, and in order to overcome these difficulties in whole or in part new operations have been constantly brought forward. Among the more recent methods is that advocated by Willy Meyer, in a paper read before the American Surgical Association, on June 5, 1902, entitled "The Implantation of Silver Filigree for the Closure of Large Hernial Apertures." In reviewing the methods hitherto employed he refers to the operation of Trendelenburg,¹ who sutured a disk taken from the head of a recently resected humerus into a hernial aperture, and later modified this method by turning into the opening a periosteal bone flap chiselled out of the patient's pelvis.

If the after-histories of the patients in whom such methods had been employed were more generally given, I doubt that the methods would have many followers. During my term of service at the New York Hospital as house surgeon, in 1889, the scapula of a recently killed dog was inserted between the muscular layers in the operation for the radical cure of inguinal hernia. This antedated Trendelenburg's original operation, but it is worthy of note that a severe chill followed the operation with high temperature, necessitating the removal of the bone plate the following day. Dr. Meyer states that, "although in possession of these various useful methods, we, nevertheless, occasionally encounter herniæ of such enormous dimensions that we know beforehand we

¹ German Surgical Congress, 1890, p. 133.

cannot permanently cure them by any of the aforementioned procedures. Such cases have been considered hitherto incurable. Yet it is just this class of cases that most urgently request and need surgical help." Dr. Meyer thinks that the implantation of silver filigree bids fair to fill this gap in our therapeutic resources. He quotes Schede in proof of the value of silver wire in closing the abdominal wall after incisions, who states that he has never had a case of ventral hernia after any abdominal operations in which the wound was thus closed.

However true this may be in cases with normal abdominal walls, it certainly does not hold true when it comes to closing hernial wounds, especially those of large size. It is only a variation of the method advocated for a number of years by Dr. A. M. Phelps, the disadvantages of which I have attempted to point out in former articles.¹ I believe that the proportion of sinuses following the use of buried silver wire, or, in fact, any non-absorbable suture, in the abdominal wall, is much greater than is generally recognized, and when a sinus has once developed it is very difficult to close it without removing the foreign body. The long-continued suppuration associated with these sinuses so weakens the abdominal wall that a recurrence almost always follows, and in a short time becomes far worse than the original hernia. These objections are by no means theoretical. The very results that I have described have been repeatedly observed at the Hospital for Ruptured and Crippled.

Witzel, of Bonn, published his method of closing abdominal wounds and hernial apertures by buried silver-wire netting in 1900. Soon after Goebel, of Leipzig, who had been working along similar lines, published the results of his operation for the implantation of ready-made silver-wire netting for the closure of hernial apertures, the first operation having been done in March, 1897. Goebel's report included eleven cases of umbilical and ventral hernia and seven of inguinal hernia in which this silver netting was implanted, and it is stated that there were but two failures.

It is impossible to judge of the value of an operation of this character without following up the cases for a considerable time after operation, and until we have a report of a fair number of cases that were traced at least two years after operation we cannot estimate its value.

In support of the use of silver-wire pads in large ventral and umbilical hernia, Dr. Meyer quotes from Dr. Phelps, who has been recommending a very similar method for inguinal hernia since 1892.

The after-histories of very few of these cases of Dr. Phelps were traced. It is my observation of some of these very cases that has

¹ PROGRESSIVE MEDICINE, June, 1900.

strengthened me in my feelings against the use of silver wire in hernia operations.

Dr. Meyer's cases are all too recent to throw any light upon the value of the method as a permanent cure. His first case in which the silver-wire method was used was a large recurrent hernia following operation for strangulation. The operation was performed June 13, 1901, and although it is stated that the wound healed by primary union it is reported that after a while a small sinus discharged serum formed at the inner angle of the scar. This closed in about six weeks; but, for the sake of safety, the patient was kept on his back for eight weeks and was not discharged from the hospital until August 19th, about nine weeks from the date of operation. Two or three weeks later the sinus reopened, discharging slightly. On November 18th, five months after operation, the following note is made: "At the upper outer angle, near the anterior-superior spine, a hernia of small dimensions is noted. Additional operation and attention to fistula advised." Again, a note of May 26, 1902, states: "Condition about the same; fistula closes and reopens. The patient states that he has been greatly benefited by the operation, and is perfectly able to attend to his heavy work."

Twelve days after this date—June 7th—while lifting a cake of ice from the wagon the patient felt a sudden intense pain, quickly followed by vomiting. Two days later he was brought to the hospital in poor condition. Operation was immediately performed, and intestinal obstruction, due, Dr. Meyer states, to old-standing adhesions between the coils of small intestine, with beginning peritonitis, was found. The patient died soon after the operation. The limited post-mortem showed that a few loops of intestine had made their way downward alongside the great vessels, but were not found to be involved in the trouble.

Although Dr. Meyer states that the wire netting had no relation to the trouble, it seems but fair to infer that the wire netting and the suture with silver wire not only did not effect a cure of the hernia, but produced a long-standing irritation and inflammation which resulted in adhesions which were responsible for the strangulation and death. Surely, such a case as this furnishes no strong evidence in favor of the method.

The second case reported was operated upon on March 1, 1900, for hernia following laparotomy. Recurrence followed five months later, and on June 29, 1901, an attempt was made to close the wound by the silver-wire netting method. The patient was kept in bed on her back for eight weeks. Dr. Meyer states that "she then got up and required no support, the rupture having been radically cured." It is stated that in the early part of October, hardly two months after leav-

ing the hospital, the patient struck her abdomen against the corner of a sink. A few months later a recurrence developed. The patient was shown before the New York Surgical Society in October, 1902, with a decided recurrence.

Case III. Female, aged thirty-one years, nullipara, very small umbilical hernia. Operation was performed April 2, 1902. A pad of silver netting, three and one-half by four inches in size, was inserted over the aperture, which was stated to have been the size of a silver dollar. The patient was kept in bed for three weeks, and then taken home, but advised to stay in bed for another week. She was reported perfectly well on June 4th; but it must be remembered that in this case only a month had elapsed since her leaving the hospital. It should also be remarked that in a case of this kind, a woman, aged only thirty-one years, without having had children, with a very small hernia, one would expect a favorable result after the older and simpler methods of operation.

The first two cases, which were really very difficult cases, the type of which Dr. Meyer states that failure has attended other methods of operation, really showed failure also from the silver-wire netting method, and, as I have said before, until results going over a period of at least two years are brought forward, no great claims can be made that the wire implantation method is any improvement over older methods.

THE PERITONEUM.

Rigidity a Sign of Peritoneal Inflammation. Blake¹ has found the presence or absence of rigidity of the greatest value in the diagnosis of acute abdominal conditions. He describes it as a reflex spasmodic contraction of the muscles of the abdominal wall, exerted not only to protect the irritated peritoneum from outside influences, but also to keep the viscera at rest. It is caused not only by inflammation, but by irritation of the peritoneum. It is, therefore, present with escape of blood, or urine, or gastric or intestinal contents into the peritoneal cavity before there has been time for inflammation to develop.

The extent of the rigidity is a reliable index to the amount of peritoneal surface affected. This is undoubtedly due to the segmental innervation of the muscles. The importance of this fact can hardly be overestimated in determining whether an inflammatory process is extending or not. Thus, rigidity may be wanting in catarrhal appendicitis as long as the inflammation has not extended to the peritoneum, but when it does so there will be rigidity varying according to the

¹ New York Medical Journal, 1903, vol. lxxvii. p. 9.

extent of peritoneal surface involved. Marked and extending rigidity occurring early in a case of appendicitis often denotes rupture.

When an abscess forms and becomes walled off by adhesions, the rigidity diminishes and may disappear altogether as the abscess becomes quiescent.

Rigidity is not present in intestinal obstruction unless there is peritonitis due to ulceration or gangrene. In typhoid fever rigidity appears as soon as the ulcers involve the peritoneum, and it becomes marked as soon as perforation occurs. The absence of rigidity is a contraindication to operation in suspected perforation.

The rigidity which is present in a case of diaphragmatic pleurisy and other inflammations of the lower portion of the thorax is slight and confined to the upper segments of the abdominal muscles. But owing to the deep situation of these muscles or to the resistance afforded by an enlarged liver one may be mistaken in supposing rigidity to exist if it is of slight degree. In doubtful cases Blake takes the ground that inflammation of the upper part of the abdomen is not present unless the rigidity extends as far as the umbilicus.

Thoracic and Abdominal Inflammation Compared. Barnard¹ reports six cases of inflammation of the lower portion of the thorax simulating abdominal trouble. They were as follows:

Right diaphragmatic pleurisy and pneumonia with marked abdominal signs, simulating appendicitis with peritonitis.

Pleuropneumonia of the right base, acute abdominal pain and vomiting, no pulmonary signs, herpes labialis, empyema, recovery.

Double basal pneumonia with right diaphragmatic pleurisy in a girl the subject of gastric ulcer, acute epigastric pain with collapse, laparotomy, death.

A case of pyopneumothorax of the right base simulating appendicular peritonitis.

A case of pyopneumothorax of the left base simulating appendicular peritonitis. Left subphrenic abscess of gastric origin.

Traumatic left pleurisy with abdominal signs, laparotomy.

These mistakes in diagnosis are easily avoided if one's suspicion is aroused. The chief points to be observed are the rapidity of the respiration—forty or more times a minute—and out of proportion to the pulse rate, which is seldom so frequent as 100 a minute and is not weak or wiry. The respiration will often exhibit the curious catch at the top of inspiration which is characteristic of pleurisy. The abdominal tenderness is, moreover, found to be chiefly superficial, so that firm, deep pressure with the flat hand may be permitted. It will then be

¹ *Lancet*, 1902, vol. ii. p. 280.

found that the abdominal wall becomes soft for a moment at each inspiration, which is not the case in acute peritonitis. The absence of rings around the eyes and a temperature of about 103° should also make one hesitate to diagnose a serious and general peritoneal infection. When once a suspicion of thoracic trouble has dawned on the mind of a surgeon the patient is comparatively safe, for an examination of the suspected side of the thorax will reveal some dulness or friction sound or some excess of costal movement on that side over the other which will lead him to pause and perhaps to consult his medical colleague; but it must be frankly admitted that direct thoracic signs are often almost entirely lacking for twenty-four hours or more.

The chief source of danger in such cases is due to the fact that the patient's general condition or his medical adviser may suggest to the surgeon that he is suffering from appendicitis, so that a thoracic examination is neglected.

Traumatisms. The question of internal injury as a complication of abdominal contusion is considered at length by Thommen,¹ who reviews the records of forty-nine patients treated in the Basle Clinic. Most of these patients were males between the ages of twenty and forty—a period of life when individuals are most exposed to accident. The histories of the accidents show that internal injury is more likely to follow if the force is applied to only a small surface. Perforation of the stomach or intestine is usually the result of direct crushing, and is to be found, therefore, at the point where the force is applied. Rupture due to increase in tension of the fluid contents is a rare accident. In 37 per cent. of the patients some portion of the alimentary canal was injured, while injuries of the liver, spleen, kidneys, and bladder are far less frequent, being altogether 23 per cent.

The symptoms which occur in the first hours after the accident are of the most importance, since operation in case of intestinal injury needs to be performed early in order to save the patient. Loss of consciousness is frequently seen, even though intra-abdominal organs are not injured. Shock may also occur without serious internal injury, but if it continues more than three hours it is probably due to hemorrhage or commencing peritonitis. Rapid and superficial respiration due to the reflex action upon the diaphragm is often seen after comparatively slight injuries. If this symptom continues it is usually due to severe injury of the abdominal wall, or to some complicating internal injury.

Pain is one of the most important symptoms after abdominal injuries, although the initial pain depends a good deal upon the sensitiveness of the individual. Continuous intense pain, which shoots from the point

¹ Archiv f. klin. Chir., 1902, vol. lxvi. p. 563.

of injury and which is markedly increased by pressure, is a frequent result of intestinal injury. Various experiments have shown that the peritoneum of the intestine has little sensation, while the parietal peritoneum is highly sensitive. Therefore, the pain after such accidents is probably due to the condition of the abdominal wall and parietal peritoneum, or is the result of infectious irritation of the visceral peritoneum.

Vomiting is a more important symptom than pain. Simple contusion without injury of the intestine rarely produces vomiting, while if the stomach or intestine has been perforated or if there is internal hemorrhage vomiting usually occurs within a period of two hours. Reference is made not to a single act of vomiting, but to repeated vomiting, and if the vomitus becomes bilious the suspicion of internal injury is even stronger. Vomiting which increases in frequency and intensity is almost certainly due to peritonitis and not to the injury. Abdominal injury does not usually prevent the passage of urine unless the bladder is injured, although commencing peritonitis may have its effect.

Special emphasis is laid upon the condition of the abdominal wall. Rigidity of the same, particularly a rigidity in the neighborhood of the injury alone, strongly suggests internal injury. For example, Roger, in a recent paper, reports 27 cases of abdominal injury. In 10 of these there was muscular rigidity. All the patients were operated upon, and every one of them had some internal injury, such as intestinal perforation, a tear in the liver or mesentery, or bladder. The 17 patients whose abdominal muscles were not contracted all recovered without operation.

Trendelenburg attributes this muscular rigidity to the mechanical irritation of the peritoneum produced by the escaping intestinal contents. Such muscular contraction is wanting in cases of intra-abdominal hemorrhage; but the contraction may also be absent in the first hours after a gunshot or stab wound which opens the intestine, so that in the early hours it must be looked upon as a result of the contusion of the abdominal wall and parietal peritoneum, and a little later it may be due to peritonitis. In exceptional cases rigidity has been present, although the contusion was confined to the abdominal wall. Tympanitic percussion and loss of hepatic dulness is an uncertain sign, since there may have been little gas in the ruptured intestine, or its escape may be prevented by prolapse of the mucous membrane. If the liver dulness is found obscured shortly after the operation this sign is a valuable one. At a later period it may be the result of meteorism. The presence of dulness in the most dependent portions of the abdomen is a symptom of intra-abdominal hemorrhage and rupture of the bladder. Variations

in the pulse are not characteristic, and the temperature may be depressed by simple contusions as well as by intra-abdominal injury.

Experiments upon animals show that diffuse peritonitis may develop within two to four hours after intestinal perforation. In the first two or three hours the exudate is of a serofibrinous character, and then, if intestinal contents are added to the exudate, the peritonitis becomes purulent or gangrenous. The statistics of various writers, as collected by Petry, show a mortality of 93 per cent. in cases of intestinal perforation treated without primary operation, and the majority of the few patients who recovered suffered from fecal abscesses which were opened at a later date. The mortality after immediate operation is only 67 per cent., and the mortality of the patients operated upon in the first twenty-four hours is 56 per cent. Such are the results after operations performed from twenty to twenty-five years ago. Kirstein cites eighteen cases with operation occurring in the last five years, and showing a mortality of 56 per cent. All of the patients who recovered were operated upon within twenty hours. Thommen reports ten operations with two recoveries, both of them following operation within twenty hours after the accident.

Thommen's experiments upon animals show clearly that injury to the peritoneum, such as that caused by a severe contusion, interferes with its power of resorption and its power to produce antitoxins. Under such circumstances injury to an abdominal organ easily leads to more serious consequences than would otherwise be the case.

Althorp¹ opened the abdomen of a boy, aged eleven years, who, in running, struck against a gate-post. On the following day the abdomen was distended, fixed, and board-like, the temperature was 100° and the pulse 100. Liver dulness was present, and the lower portion of the abdomen was dull on percussion. Normal urine was drawn by a catheter, and the bowels moved after an enema. A suprapubic incision was made, and a large quantity of serum and flakes of fibrin escaped. The appendix, bladder, cæcum, etc., appeared normal. A second incision was made above the umbilicus, but no lesion was found. The peritoneal cavity was sponged dry and both wounds were closed. The patient improved, but twelve days later suffered from intestinal obstruction due to adhesions at the lower incision. The abdomen was opened, a loop of small intestine freed, and the symptoms subsided. Five days later the symptoms recurred. The abdomen was opened for the third time in three weeks, and the small intestine was found so firmly adherent that it was necessary to resect six inches of it. Recovery was uneventful, the Murphy button being passed per rectum one

¹ *Lancet*, 1902, vol. ii. p. 1459.

week later. The operator considered this a case of diffuse peritonitis of traumatic origin without serious injury of any of the viscera. It certainly was not an infective inflammation, but was apparently a serous effusion due to traumatism similar to the effusion which occurs after traumatism of the knee-joint and other serous cavities. It is better to limit the term "diffuse peritonitis" to inflammation of bacterial origin. There is every reason to suppose that this boy would have recovered without operation, as certainly his vitality was in nowise at fault.

Acute Peritonitis. Lennander¹ has written an article upon acute peritonitis which ought to be in the hands of every abdominal surgeon. It is too long for a complete review, being virtually a monograph upon the subject. Some of the newer views and practical conclusions are here given. The parietal peritoneum is as sensitive as the papillary layer in the skin. Peritoneal pain is due to stretching. The peritoneum of the stomach, intestine, liver, gall-bladder, omentum, and that portion of the mesentery which is close to the intestine possesses no sensitive nerves, but tension upon the mesentery or attachments of the organs mentioned may be very painful. It is probable that there are no sensitive nerves in the walls of the stomach, intestine, etc., and that the pain caused in the diseases of these organs is due to a lymphangitis extending to the parietal peritoneum, or to direct adhesions with the parietal peritoneum.

Saline solution for irrigation should be of such strength that the solution is isotonic—that is, about 0.9 per cent. But if the solution is left in the abdominal cavity it is better to make it a little weaker by adding a third part of sterile water, for experiments show that a hypotonic solution is more rapidly absorbed than an isotonic one, while a hypertonic solution seems not to be taken up at all until enough serum from the tissues is mixed with it to make it isotonic or hypotonic. As the resorption takes place most rapidly in the neighborhood of the central tendon of the diaphragm, the pelvis of the patient should be higher than his shoulders when fluid is left in the abdominal cavity. Experiments have shown that substances injected into the peritoneal cavity may be detected in the urine seven minutes afterward.

The peritoneal cavity is protected from infection by a quick absorption of the bacteria, by phagocytosis, and by the antiseptic action of the peritoneal fluid—a property which is markedly increased if it contains the remains of destroyed white blood corpuscles. If bacteria are injected into the peritoneal cavity in great quantity they cannot all be absorbed at once, and some have an opportunity to multiply and produce toxins which, like other chemical substances, set up peritonitis

¹ Deutsche Zeitschrift f. Chirurgie, 1902, vol. lxiii. p. 1.

and interfere with resorption. In testing for bacteria it is better to scrape the serous surface or cut away a little piece of the peritoneum, since the fluid exudate may sometimes contain few or no bacteria, although they exist within or upon the serous membrane.

Lennander insists upon the desirability of making bacteriological examinations of the blood and urine of a patient who is suffering from peritonitis. This is especially true if the urine contains albumin and casts. He cites actual cases to show that the urine may contain within twenty-four hours or less the particular species of micro-organism which is causing peritonitis.

The so-called dry form of peritonitis is universally recognized to be very fatal. Resorption goes on so rapidly that the exudate is slight. In these cases the inflammation seems to spread in the subserous lymphatic channels exactly as erysipelas in the skin.

The regions in which peritonitis is most apt to be circumscribed are the pelvis, the iliac fossa, the lumbar regions, the vicinity of the gall-bladder, and the subphrenic space. Infection in the subphrenic space is, other things being equal, the most serious of these circumscribed forms, because resorption takes place more rapidly at the root of the diaphragm, and because the lymph vessels from the diaphragm quickly carry infectious material by way of the mediastinal lymph glands and thoracic duct into the blood circulation; or, they may spread it in the serous cavities of the thorax. All the other places mentioned as the common seats of circumscribed peritonitis are situated in the periphery of the peritoneal cavity.

Normally the temperature in the rectum is about 0.06° C. (1° F.) higher than that in the axilla. In peritonitis the difference is often considerably greater. If it is much greater it is an indication that the circulation of blood in the skin is poor, which is an unfavorable sign. Sometimes shortly before death there is a difference of 2° or 3° between the axilla and the rectum. The temperature usually falls if a focus of infection becomes encapsulated. A low temperature in connection with a very large intraperitoneal abscess indicates that the lymphatic channels are thrombosed or closed by pressure. When the pus is evacuated the temperature will rise for a few days, showing that resorption is resumed. A rising temperature in encapsulated peritonitis indicates a purulent exudate or a spreading inflammation.

Local pain and tenderness on pressure are an aid not merely to the diagnosis of peritonitis, but in determining its origin. Furthermore, it can be demonstrated that in a spreading peritonitis the tenderness is greatest in those portions of the parietal peritoneum which have most recently been affected. It may be that the nerve terminations are benumbed by the older inflammation. A skilful examiner can tell by

Careful palpation how far the parietal serosa is involved in the inflammation.

The internal treatment, recommended by Lennander, is absolute rest of the stomach and intestine. Neither food nor drink is given by mouth, and water is supplied from the beginning of the illness by subcutaneous injections morning and night of 600 to 1000 c.c. (20 to 35 ounces) of salt solution. Hard fecal matter in the rectum is extracted digitally. Opium is given by the rectum in sufficient doses to quiet the pain if the patient is absolutely still. Hyperæmia of the abdominal skin is obtained by the application of ice or heat. Hunger is relieved by subcutaneous injection of olive oil forced into the front of the thigh by means of a column of sterile water three or four feet high. If from 100 to 200 c.c. (3 to 7 ounces) are injected in this manner in from one to two hours the pain will be slight. The oil is resorbed in from six to twelve hours. If the oil is injected with an ordinary syringe not more than 30 or 40 c.c. (1 to 1.5 ounces) can be introduced in one place on account of the pain. This internal treatment will not appeal much to American surgeons, and, Lennander says, it should only be followed in cases in which the infectious material is limited in quantity and of slight virulence. He cites as examples certain cases of perforation of the appendix, perforation of an empty stomach, or a small perforation in the colon in the presence of solid contents, etc. He recommends immediate operation in all other cases of perforation, or of suspected perforation, for example, after severe abdominal injury.

The use of calomel and salines may save a patient who is suffering from peritoneal irritation, the result of severe enteritis or gastro-enteritis, or one who is suffering from intestinal obstruction following laparotomy. Otherwise, he does not recommend this treatment.

A serious complication which may follow even encapsulated peritonitis is thrombosis of the veins of one or both lower extremities. This can be avoided in most cases if as a routine practice the lower end of the bed is raised from 10 to 40 cm. (4 to 16 inches) so as to favor the flow of blood toward the heart. A pillow should be placed beneath the shoulders and thorax so that the lumbar region may remain the lowest portion of the abdomen. Concentration of the blood should be avoided by saline infusions, and heart tonics should be given if necessary.

Lennander says that drainage of purulent collections through the vagina or rectum is too seldom attended to. The risk is slight, and the relief to the patient by the removal of a large foul exudate is very great. Incision for drainage should be made primarily in the iliac or lumbar region when the pus collects there. He does not believe in

irrigating a circumscribed cavity on account of the risk of breaking down adhesions. He sponges it dry and keeps it so by means of frequently changed gauze drains.

A reduction of the mortality from diffuse peritonitis is to be looked for in the early diagnosis of the conditions which may cause this trouble. The surgeon should not only recognize perforation as soon as it occurs, but should so familiarize himself with diseases of the stomach, intestine, and biliary passages as to be able to prevent perforation by a timely operation.

Irrigation of the abdomen is not recommended except in cases in which the meteorism interferes with the proper cleansing of the affected peritoneum by sponges. In such and all other cases it is well to prevent drying out of the tissues by large venous or subcutaneous injections of saline solution. He says, justly, that the question of irrigation is in an unsatisfactory state, and cannot be settled until a large number of carefully performed experiments are made in order to determine its effect upon healthy and diseased endothelium and upon the rapidity of resorption. With this opinion I fully concur.

Before the last Congress of the German Surgical Society, held at Berlin, April 3, 1902, Rehn¹ presented a paper on the "Treatment of Infectious Suppurative Processes in the Peritoneum." He endeavors to determine the extent to which these processes should be treated surgically and what general rules as regards technique should be adopted—questions which he considers of equal importance to the surgeon and gynecologist. After citing the various conditions, concerning which there is no division of opinion as to the indication for surgical intervention, he very aptly remarks that from this it would seem but logical to infer that the profession were agreed that all suppurative processes that are not absolutely beyond danger should be operated upon as early as possible. That this is not so he is well aware, and while he admits that there are cases that get well without operation, he states that this fact is of no value to the individual, since it is impossible to determine beforehand the exact extent of a peritoneal inflammation, even bacteriological examinations being not absolutely reliable. His own opinion is that since relatively benign infections cannot be recognized with any degree of certainty, and since the more serious forms do not yield to internal treatment, the only logical course to pursue is to operate in every instance, no matter whether the danger arise from the intestinal tract, biliary system, genital organs, or elsewhere. He considers early operation not only free from danger, but also the only means of reducing the number of serious cases of peri-

¹ *Archiv f. klin. Chir.*, 1902, vol. lxxvii., No. 4.

tonitis, for, while it certainly is a triumph of surgery that we are able to still save a certain proportion of cases in which infection has become widespread, it must be conceded that the only safe treatment lies in the prophylaxis.

The reluctance, so general among surgeons, to widely open the peritoneal cavity in cases of suppuration, he thinks, is due partly to the sad experiences of many surgeons, partly to the dogma as to the great danger of peritoneal infection. The latter fear he does not consider justified, in that not only experiments but also our clinical experiences show that the peritoneum possesses extraordinary powers of resistance to infection. Rehn believes that if the old dogma were well founded not a single intestinal suture would ever heal. He rather inclines to the view that many of the disappointing results recorded are due to faulty technique. Quick discernment, a careful hand, and decisive action are absolutely essential to a good result, and there is no more careful way of evacuating the pus, he states, than irrigation. He uses saline solution at a temperature of about 100° F., and sterilized by an apparatus especially constructed for the purpose. There is no safety, he declares, in the treatment of such suppurative processes without drainage, which is generally established in the anterior and lateral abdominal wall, rarely in the region of the vagina, and never in the lumbar region. He considers that method of drainage most efficient which, being sufficiently effective, does least harm to the neighboring regions, and these conditions are best met, he thinks, by smooth rubber tubes, iodoform being too irritating and too apt to form firm adhesions and to become intimately matted together with the surrounding parts. Of course, if it be desired to firmly and quickly shut off from the remaining abdominal cavity an abscess cavity where prolonged secretion is to be expected, iodoform is employed—that is, the latter is wound around a thick drainage tube, which at the same time ensures the proper escape of the secretion. Firm tamponade he does not recommend. It is a great mistake, he states, to think that drainage is facilitated by leaving the abdominal wound wide open. The contrary is the case; the light intestine will enter the wound, while in the depth the secretion stagnates; the pressure of the intestines and diaphragm are needed to force out the infected substance. Rehn states there is no tissue, no cavity, that offers more favorable conditions for the healing of an infection than the peritoneum. If, however, it be found that the abdomen has been divided into numerous abscess cavities by a number of adhesions, the situation is more difficult, and the protective qualities of the peritoneum become a menace instead of being a blessing.

In addition to his 85 cases of abscess originating in the appendix, with 8 deaths, published last year, Rehn now reports 26 cases of sup-

purative appendicitis operated upon since then without mortality. Of 24 cases in which the abscess developed in connection with pyosalpinx, only 1 died, and in this case a phlegmon had developed before the patient came to the hospital.

He further mentions 2 cases of subhepatic suppuration with serious septic symptoms, 1 case of liver abscess, and 2 cases of suppuration of the mesenteric glands, all of which were cured.

In a few of the 85 cases reported last year the free peritoneal cavity was not opened. In this year's series—55 in number—the free peritoneal cavity was opened in every instance. In the cases of pyosalpinx the incision was made in the linea alba, and the diseased appendix or tube was removed in every instance. Rehn states that the foregoing series comprises fresh abscesses as well as such of long standing, purely suppurative and saniosuppurative, septic and pyæmic cases, and that the most varying types of bacteria were present in these abscesses. He believes, therefore, that the old dogma of the great liability to infection of the peritoneum must fall. The majority of these suppurations were progredient and might as well be termed progredient peritonitis.

Of 22 cases of extensive peritonitis, 9 recovered and 13 died. In 9 of these the infection started from the appendix, in 13 from the tubes.

This shows that with the extent of the infection the safety of operation diminishes and the death rate increases.

In conclusion, Rehn repeats what he emphasized in a former paper, that it is simpler to cure appendicitis than perityphlitis; it is easier to cure a fresh local suppuration than beginning peritonitis.

General Purulent Peritonitis. The treatment of general peritonitis is a subject that never loses its interest to the physician and surgeon. A recent volume of *Medical and Surgical Reports of the Boston City Hospital*, 1902, by Dr. Edward Wells Dwight, contains a report of 45 patients, of whom 15 recovered. The treatment followed in the cases reported is based upon the attempt to decrease the quantity of bacteria present to the greatest possible degree with the least possible diminution of the resistance of the patient, believing that if the vitality is lowered beyond a reasonable point the decrease in the quantity of bacteria is of little account. Dwight states: "Any operation the effect of which so enfeebles the patient as to cause death upon the operating-table, or leaves him with practically no resisting power, is worse than useless, no matter how carefully the toilet of the peritoneum has been performed." He believes that if a patient shows signs of septic absorption everything else should be sacrificed to two points, namely, diminishing the dose of the bacteria and maintaining the resistance. For this reason no attempt is made at asepsis of the skin; the patient is placed upon the operating-table with the least possible exposure and exertion,

etherized very lightly, anæsthesia never going beyond the stage of stimulation. Stimulants are seldom given before operation, and the ether used in the way advocated acts as a strong stimulant.

In regard to the operation, incision is made over the source of infection if known, if not, in the median line, sufficiently large to permit of moderate exploration. A one and one-half to two and one-half-inch incision Dwight believes sufficient for this purpose. The advantages of the short incision are believed to be the ease with which coils of intestine are prevented from protruding. If the purulent fluid is found free in the abdominal cavity, he thinks that prolonged exploration is contraindicated. If the appendix or Fallopian tube presents itself at the opening, it is tied off as quickly as possible. If not easily found, no effort is made to discover it. Through this opening a large glass fascia tube, one inch in diameter, twelve inches long, is introduced. Through it is poured a large quantity of normal salt solution as hot as it can be borne with comfort on the back of the hand. Flushing is kept up until the fluid returns from all portions of the peritoneal cavity quite clear. The tube is then removed, the excess of fluid permitted to escape, and three to four gauze drains are placed in different parts of the abdomen. He states that if the ether is given in the way advocated the pulse is usually better at the end of the operation than in the beginning. A very large quantity of salt solution is used, twenty to twenty-five two-quart bottles in a single operation. If this method is carried out accurately, it is believed that the toxic dose is reduced to the minimum with the least traumatism to the peritoneum.

In regard to after-treatment, nourishment is advised within twelve hours in amounts as large as the patient can bear. If vomiting continues, rectal feeding is substituted. Should small localized abscesses subsequently develop in different parts of the peritoneal cavity, primary anæsthesia is again produced and the abscess cavities emptied.

A study of all the cases at the Boston City Hospital shows that the prognosis cannot be definitely made from the symptoms present. Several cases recovered that, at the time of the operation, were in most profound collapse with all the symptoms of extreme toxæmia, while several of those that died were in fair condition at the beginning of the operation. Very little value is placed by Dwight upon the height of the temperature and the character of the pulse or the age of the patient. Likewise, the source of infection, whether from the appendix or the tube, seems to have little bearing upon the prognosis. In the cases originating from an appendix the number of recoveries were slightly greater. The character of the infection, however, is more important. While cultures were not systematically taken, those with streptococcus pyogenes seldom recovered. One fact of great interest was

that the average duration of the infection in the cases that died was sixty-nine hours, while that in those that recovered was seventy-seven hours.

The mortality in this series of cases was 57 per cent., which, however high, is decidedly better than was considered possible a few years ago.

It would be interesting to compare this series of cases treated by irrigation and drainage with a similar series of cases treated by the method of closing the abdominal wound without drainage, advocated by many excellent surgeons. Up to the present time no large series treated by this method has been published, and while I am personally strongly in favor of drainage the real value of the two methods cannot be settled by any *a priori* reasoning, but must be determined by facts.

Postoperative Conditions. Wiggin¹ believes that postoperative intestinal paresis may be successfully overcome in almost all cases if the surgeon is on the watch for the early symptoms and is prompt in treatment. The trouble is thought to be due to trauma of the intestinal nerves, and it is especially likely to arise if the operation is a long one or is rendered more difficult by gaseous distention of the intestine. Hence the great importance of an empty stomach and bowel before the anæsthetic is given. If there is no time for a proper preparation the stomach should be washed out after the operation, before the patient regains consciousness, and four or five ounces of a saturated solution of magnesium sulphate should be poured through the stomach tube before it is withdrawn. If symptoms are first noted some hours after operation, the contents of the blue paper of a Seidlitz powder should be dissolved in a full glass of water, the contents of the white paper scattered upon the surface, and the patient directed to drink it while effervescence is going on. The generation of a part of the gas in the stomach will help to overcome the pressure of gas in the intestine. If the draught is vomited a second tumbler should be given, and if this is not retained the stomach should be washed out and saturated solution of magnesium sulphate introduced. The use of a rectal tube and of hypodermic administration of strychnine and atropine is also recommended, but the essential part of the treatment is that mentioned above. Since adopting this method of handling cases of postoperative tympanites, Wiggin has reduced his operative mortality in chronic abdominal conditions from 10 per cent. to less than 1 per cent.

Humiston² pours not less than two quarts of normal saline solution into the abdominal cavity before tying the final stitches after laparotomy. The condition of the patient so treated, he states, will improve almost

¹ Journal of the American Medical Association, 1902, vol. xxxix. p. 627.

² American Journal of Obstetrics, October, 1902.

immediately ; there will be little thirst for several hours, and no enemata will be required. If the abdomen is opened through the vagina this method of saline administration is not practical, and subcutaneous injection is substituted for it. The trocar is inserted at the upper and outer margin of the breast in a direction downward and backward so that the fluid may pass into the loose tissues of the axilla and beneath the scapula. Three or four quarts can be injected under four feet of pressure with a little massage. If a sterile solution of saline is not prepared an unsterilized solution may be injected into the colon by a tube passed per rectum with the patient in the Trendelenburg position. The passage of the tube above the pelvic brim is aided by the hand in the abdomen. Drainage of the abdominal cavity is largely superseded by this method of treatment.

Pelvic Suppuration in the Male. Fuller¹ gives some excellent advice as to the treatment of pelvic suppuration in the male when the pus is outside of both the peritoneal cavity and the bladder. The key to the situation is an incision in the groin, such as is used for ligating the external iliac artery. Through such an incision one can easily probe the deepest abscess, and follow its extension upward into the space of Retzius or downward along the thigh, or upward toward the kidney. Pus rarely passes from one lateral pelvic space to the other. If the position of pus is well marked in any of the situations mentioned, but is not so well marked in the groin, a first incision may be made directly into the pointing abscess cavity, and a probe passed from that point to the groin. A second incision should in all cases be made down upon the probe in the groin, since this is the most favorable point for exploration and drainage. Fuller makes a counter-opening into the abscess cavity through the perineum. For this purpose he places the patient in the knee-chest position, divides the skin by the incision used for exposure of the seminal vesicles, and passes a finger into the wound to feel for the tip of the probe passed through the inguinal wound. When it is recognized it is cut down upon and the wound stretched until it will easily take a good-sized rubber tube. Through drainage from groin to perineum is kept up until good granulations are established. If pelvic suppuration is handled in this manner rapid recovery will follow in cases which not infrequently terminate fatally after a single abdominal incision.

Actinomycosis. Rowland² reports three cases of actinomycosis developing in the right lower quadrant of the abdomen and showing a tendency to form sinuses in the lumbar region. Two of them were of

¹ Journal of the American Medical Association, 1902, vol. xxxix. p. 1022.

² Lancet, 1902, vol. ii. p. 671.

the usual type, with abdominal pain and swelling and disturbances of digestion lasting for six or eight weeks before an abscess was opened. In the third case, however, the course of the disease was much more rapid, and two weeks after the acute attack of pain in the right iliac region an abscess was opened which was thought to be due to appendicitis. Later other abscesses formed in the loin and in the neighborhood of the incision and also in the jaw. Repeated examination of the pus from these sinuses failed to show anything characteristic, and the disease was considered tuberculous until positive evidence of actinomycotic granules was obtained.

THE STOMACH.

X-ray Methods of Diagnosis and Treatment. Fault has been found with the X-ray on the ground that it is an unreliable means of diagnosis, but the mistakes have all been in the interpretations of its shadow pictures. It would be idle to expect one looking into a microscope for the first time to make a diagnosis, and it is no less so for a person who has not taken time for a study of radiographs of normal structures to say what is abnormal in a radiograph. The more one uses the X-ray as a means of diagnosis the more expert he becomes in the correct interpretation of its shadows. The following cases are of great value as showing errors into which those may fall who are not beginners:

Crile, of Cleveland,¹ reports a very interesting case of exploratory operation for the removal of artificial teeth supposed to have been swallowed. The patient, a prominent business man in good health, was suddenly awakened in the early morning of October 14, 1902, believing that he had swallowed a lower set of artificial teeth. He felt himself choking, and made violent efforts for an hour and half to dislodge them from the pharynx. His family physician also later made a second attempt without success. Under chloroform anæsthesia the pharynx and œsophagus to the stomach were carefully explored, and a small incision made in the neck, permitting palpation of the entire pharynx and œsophagus to below the level of the sternum. The patient later developed dyspnoea, and, for a time, became cyanotic, making tracheotomy necessary. Careful examination was made with the fluoroscope, and a radiograph was also made by an X-ray expert, who reported the location of the teeth at a level of the superior internal angle of the scapula. So much positive evidence seemed to warrant

¹ Cleveland Medical Journal, December, 1902.

further operation, and twenty-six hours after the exploration the stomach was opened and carefully examined; a string was also passed from the mouth to the stomach with a folded piece of gauze attached. There seemed to be an obstruction at a level of the border of the sternum. The original incision of the neck was then reopened and an incision made in the œsophagus at that point and digital examination made. Nothing being found, the wounds were closed, and the patient was placed in bed. A renewed search was made by a relative, and the false teeth were found on the floor in an obscure place in the patient's bedroom. The patient died fifteen hours after the operation. Autopsy showed a marked degree of calcification of the larynx, and the X-ray error is believed to have been due to a misinterpretation of the shadow of a heavily atheromatous aorta.

In connection with the question as to the diagnostic value of the Röntgen ray, a similar case from the clinic of Prof. König is cited:

A girl, aged twenty-two years, claimed to have swallowed a part of her artificial teeth while drinking coffee. Three days later pressure tenderness developed in the ileocæcal region. The X-ray showed a shadow in that locality. The condition remaining the same, a laparotomy was done fifteen days later. A careful examination of the entire intestinal tract was made, with negative results. After closure of the abdominal wound the relatives brought the missing plate, which had been found under the bed.

A further case, observed at Mikulicz's clinic, is mentioned: A man had swallowed his plate with one tooth, and stated he could feel the same in the region of the stomach. The Röntgen rays showed a shadow in the stomach, but none in the course of the œsophagus. It was, therefore, assumed that the plate had passed into the stomach. Two days later, however, suspicion arose that the plate was still in the œsophagus, and the Röntgen ray then also seemed to bear out this assumption. The œsophagoscope was used, showing the plate lodged in the œsophagus, 35 cm. from the teeth.

In another case from Mikulicz's clinic a plate 3 to 4 cm. long with three teeth had been swallowed. Skiagraphy gave a negative result, while by means of the sound it was promptly located.

Similar instances have been reported at various times. The failure of the X-ray to detect the presence of a foreign body is especially evident when the objects are located in the thoracic portion of the œsophagus, as here the heart anteriorly, the vertebral column posteriorly, seem to produce such dense shadows as to render the distinguishing of an intermediate object very difficult. Wilms, therefore, suggests that the Röntgen ray be applied so as to pass the body obliquely, thus avoiding both heart and vertebral column.

In view of the uncertainty of skiagraphy, as demonstrated by the cases cited, Crile states that it cannot be looked upon as an important diagnostic measure, but merely as an accessory in diagnosing the presence of a foreign body.

Crile further calls attention to the fact that anatomical structures, for example, the cornua of the hyoid bone, have been frequently mistaken for foreign bodies, and that by some of the most distinguished surgeons.

He believes the removal of such sharp-pointed objects as artificial teeth imperative, death not infrequently resulting from failure to do so. Ostermaier, in 1885, reported a collection of 25 cases in which artificial teeth had been swallowed. In 11 of these the teeth were not removed, with the result that in 4, or 36 per cent., death occurred from perforation into the trachea, 2; aorta, 1, and pericardium, 1. In 4 the teeth passed per rectum; in 2 they were vomited up, and 1 remained in a diverticulum of the œsophagus.

Crile refers to another collection of 27 cases in which teeth plates remained in the alimentary canal. The outcome was as follows: In 8 cases they were passed per rectum; in 4, vomited up; in 7 they remained in the canal without causing death; in 7, or 26 per cent., death followed.

While there are several cases recorded in which artificial teeth plates remained lodged in the œsophagus for long periods of time, the risks and discomfort involved are so great that their removal is to be considered a necessity.

As to the method of removing the obstructing object Crile¹ states that extraction through the mouth by forceps or a coin-catcher should be attempted first if the plate has been definitely located. He warns against too great persistence in this attempt, stating that in thirty-nine cases collected in which the plate was removed in this manner, death resulted six times, or in, approximately, 15 per cent., as a result of laceration and consequent infection of the parts. If it is impossible to thus extract the foreign body œsophagotomy should be immediately resorted to, since the earlier operation and removal are attempted, the better the chances of success. It has been shown by Fisher, who collected 108 cases in which œsophagotomy for the removal of foreign bodies was done, that the mortality in the first two days was 5 per cent. less than that between the third and sixth day, and that in the first three days it was 15 per cent. less than from the fourth to the eighth day. Krönlein, likewise, reports a difference of 12 per cent. in the first three days. The mortality of œsophagotomy, based on a

¹ Crile appends tables covering the various groups of cases referred to in his paper.

series of sixty-eight cases taken from the literature, is stated by Crile at 9 per cent.

As regards gastrotomy performed for the removal of artificial teeth, 11 cases have been reported, with 4 deaths, 2 of which can hardly be ascribed to the operation, as in one case a perforation of the stomach was found at the time of operation, in the other an ulcer of the œsophagus.

In two other cases laparotomy for the locating of the plate was performed, one by MacEwen and the other by König. In neither was the plate found. In MacEwen's case it passed per rectum twelve days later, and in König's case it was found under the bed. Œsophagotomy through the posterior mediastinum has been done but once, by Enderlen. All of these three cases recovered.

Mayou¹ devised a most ingenious instrument for the removal of small metallic objects from the stomach without external operation. The instrument consists of a round electro-magnet two inches in length and five-sixteenths of an inch in diameter, the centres of which are made of soft iron and wound in the ordinary way, having a lifting power of a quarter of a pound when connected with stiff wires to a fourfold battery. This magnet is inserted into an ordinary stomach tube with the end cut off, or, preferably, a tube with a perfectly smooth inner surface, so that the magnet can glide up and down with ease when the stiff connecting wires are pulled upon. A narrow silver ring is placed on the extremity of the stomach tube so that the end of the tube is easily seen in the stomach, the rest of the stomach not offering any shadow by X-rays. The tube containing the magnet is passed into the stomach, preferably under an anæsthetic. The X-ray tube is placed beneath the patient, who lies on his back and the screen is placed on the abdomen; the room is darkened, the X-ray tube is excited, and the position of the magnet and foreign body are easily seen. The current is allowed to flow through the magnet, which is brought into contact with the foreign body, and both are withdrawn into the celluloid tube by means of the connecting wires. When the foreign body has been seen to pass the silver ring into the tube the latter is withdrawn together with the magnet and foreign body. By means of this instrument Mayou removed a hair-pin from the stomach of a boy, aged two years and three months, which had partially entered the duodenum and had lain there seven weeks without changing its position. Meantime the patient had suffered from attacks of diarrhœa and vomiting. Recovery was immediate. The patient left the hospital the same day.

Hamilton² has also used the X-ray in combination with a coin-

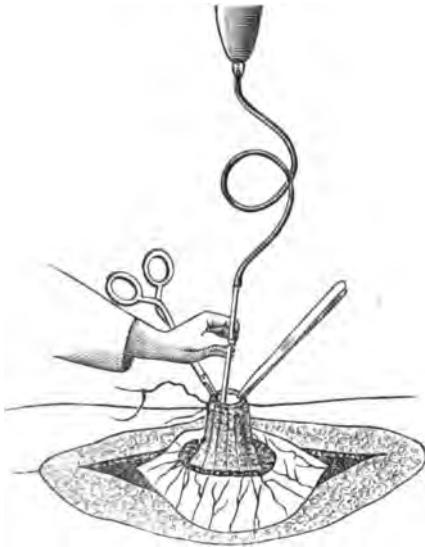
¹ *Lancet*, 1902, vol. ii. p. 1536.

² *Ibid.*, p. 1623.

catcher to extract coins from the œsophagus. The patient was placed on a canvas couch, below which was the X-ray tube, while the screen was laid on the chest. The relative position of the coin and the jaws of the forceps could be seen and the use of the instrument directly controlled thereby. He cites the case of a child, aged two years and three months, from whom he was able to remove a half-penny at the very first attempt.

By a similar device Garet¹ had before succeeded in removing a needle from the bronchus, and Hofmeister² an iron pencil from the male bladder measuring 5 cm. (two inches) in length and 6 mm. (one-quarter of an inch) in thickness. Its presence was shown by a radiograph, but the fluoroscope was not used to facilitate the extraction of the foreign body. A few days afterward Hofmeister extracted a hair-pin from the female bladder by the same means.

FIG. 9.



Irrigation of bursa omentalis through the opening in the posterior wall of the stomach.

Traumatism and the Purse-string Suture. Senn³ has shown by experiments upon animals that a purse-string suture is a rapid and safe method of closing gunshot wounds of the stomach or intestine. In the case of the stomach the wound of the anterior wall can be enlarged and utilized for the closure of a wound in the posterior wall. The posterior wall is brought out through the anterior wound, and before it

¹ *Annales d. mal. d. l'Oreille, etc.*, 1901.

² *Beiträge z. klin. Chir.*, 1902, vol. xxxv. p. 830.

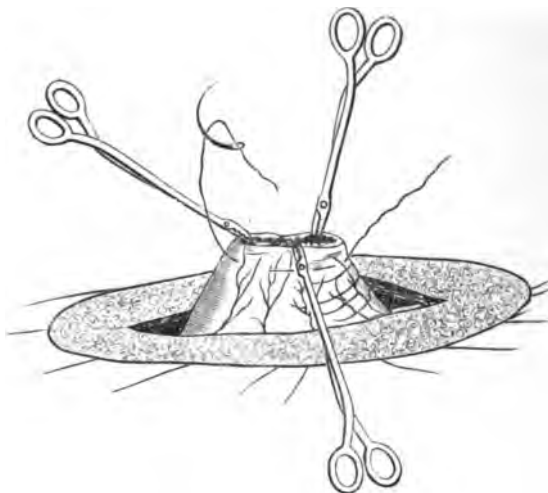
³ *Journal of the American Medical Association*, 1902, vol. xxxix. p. 1182.

is sutured the cavity of the lesser peritoneum may be examined or irrigated through it without handling the stomach. (Fig. 9.)

Figs. 10 and 11 show the insertion of the suture and the appearance of the stomach after it is tied.

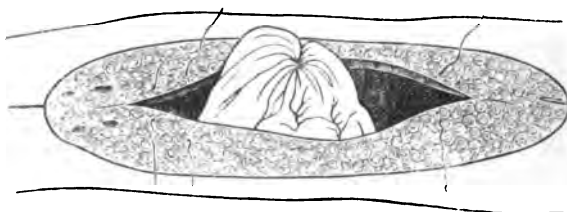
Gastric Hemorrhage following Laparotomy. The hemorrhage which sometimes occurs from the mucous membrane of the stomach or intestine following abdominal operations has been variously ascribed to

FIG. 10.



Purse-string silk suture in place.

FIG. 11.



Showing result of purse-string silk suture closing anterior wound in stomach wall.

violent vomiting in connection with the preoperative fast, to pulling upon the stomach or its attachments, to ligation of the omentum or mesentery, and to the extension of thrombi thus formed to the vessels of the stomach. Yet the number of cases of gastric hemorrhage following operation is trifling compared with the number of cases in which the omentum is ligated. Landow¹ cites two cases of postoperative hemorrhage, in one of which he attributes the bleeding to the

¹ *Archiv f. klin. Chir.*, vol. lxxvi. p. 900.

handling of the stomach at operation (invagination of its wall through the pylorus, etc.), while in the other he believes that the hemorrhage was due to the chloroform, as the patient showed herself peculiarly susceptible to anæsthetics. It seems natural that hemorrhage should follow undue handling, since cases of gastric ulcer following traumatism are not so very rare. Several have been reported in which the patient has been successfully treated by operation. Jäckh¹ reports such a one.

Gastric Ulcer. OPERATIONS FOR HEMORRHAGE. Moullin,² in discussing the necessity for surgical interference in cases of gastric ulcer with hemorrhage, says that a different treatment is necessary in men and in women, for the reason that such hemorrhage is rarely fatal in women under thirty years of age, there being only one death in 153 cases, whereas, the mortality from hemorrhage in women over thirty years was 6 per cent., and in men over thirty years it was 12½ per cent. He reports only 5 cases in men under thirty years, 1 of them terminating fatally. These figures are concerned only with mortality from hemorrhage in gastric ulcer, and it should not be forgotten that there may be other reasons for operating. Thus, it is generally admitted that perforation should always be met by prompt operation. Moullin also operates when there is a continuance of pain after eating in spite of medicinal and dietetic treatment, including a period of rectal feeding, when vomiting after eating obstinately persists, as well as when the patient is steadily losing ground. If a patient suffers from one single severe hemorrhage and there is reason to believe from the history that there is a chronic gastric ulcer, the blood probably comes from a larger vessel. This probability is strengthened if there are two separate attacks of severe hemorrhage at a short interval. This is sufficient ground for operation. Operation is also indicated if there are frequent small hemorrhages so that the patient is becoming seriously anæmic.

Practitioners are by no means agreed as to the indications for operation in gastric hemorrhage.³ Mikulicz takes the conservative view that in all cases internal treatment should first be given a fair trial. Leube holds that a single large hemorrhage is only a relative indication for operation, which need not be performed unless it recurs in such a manner as to threaten a patient's life. He looks upon repeated small hemorrhages as a stronger indication for operation.

It is difficult to say in any case whether the loss of blood is sufficient to threaten the life of the individual. If operation is decided upon there are several methods of stopping the hemorrhage, namely, incision

¹ *Archiv f. klin. Chir.*, vol. lxvi. p. 938.

² *Lancet*, 1902, vol. ii. p. 17.

³ *Kaupe, Deutsche Zeitschrift f. Chirurgie*, 1902, vol. lxii. p. 566.

of the ulcer, cauterization of the ulcer, or ligation of the artery which supplies the region of the ulcer—an operation which has recently been performed with success by Witzel. In case the ulcer cannot be found or satisfactorily treated gastro-enterostomy seems to improve the patient's chances of recovery. Tamponade of the bleeding area is an unfortunate method of treatment which should only be adopted as a last resort. The difficulties of ligating the affected vessel may be very great. In some cases it is impossible to find the ulcer, and in others the state of the patient does not permit of a long search. Usually the hemorrhage comes from a branch of the superior coronary artery or from one of the pancreatic vessels. Even if the affected vessel is found, infiltration of the tissue about it, or its situation in the pancreas, may prevent the application of the ligature. Witzel operated upon a woman, aged thirty-six years, who lost about 2 litres (4 pints) of blood in the first hemorrhage, and about 2.5 litres (5 pints) more in two subsequent hemorrhages occurring within a few days. Operation was performed fourteen hours after the third hemorrhage. There were slight adhesions on the posterior surface of the lesser curvature of the stomach, and the arteries in the vicinity were markedly dilated and lengthened almost like a cirroid aneurism. The superior coronary arteries (right and left) were ligated and the abdomen closed. The patient made a good recovery, aided, doubtless, by the fact that up to the time of the hemorrhage she had enjoyed excellent health.

Kaupe cites four other cases in which the vessels were ligated in the immediate vicinity of an ulcer. Mikulicz excised an ulcer and ligated the vessels in the vicinity, closing the wound by suture. Roux operated in three other cases. Once he ligated the arteries and then excised the ulcer; once he ligated and then performed gastro-enterostomy, and once ligation was the only operation performed. All four of these patients recovered. It is not to be supposed that so high a percentage of recovery can be obtained after any operation, and a single method of operating is probably not suited to all cases of gastric hemorrhage. But where, as in Witzel's case, the site of the ulcer is clearly indicated by commencing adhesions, and the arteries which supply it are accessible, ligation ought certainly to be considered on account of the rapidity with which it can be carried out and the proportionate freedom from shock to the patient.

OPERATIONS FOR PERFORATION. Hotchkiss¹ reports a case of perforating gastric ulcer successfully treated by suture, although sixty hours elapsed between the perforation and operation, and there was a fibrinopurulent peritonitis of both sides of the abdominal cavity above

¹ New York State Journal of Medicine, 1902, vol. ii. p. 141.

the transverse colon, and a congestion with slight fibrin formation of the peritoneal cavity between the transverse colon and pelvis. The pockets above the colon were carefully cleansed with hydrogen peroxide solution and hot salt solution. The general cavity was irrigated with hot salt solution, and a quart or more was allowed to remain when the peritoneum was closed without drainage. This case is worth mention on account of the long time which elapsed before operation was performed. In most of the operations performed twenty-four hours or more after perforation, recovery has been due to the fact that adhesive peritonitis has protected the peritoneal cavity from infection. In Hotchkiss' case, however, the inflammation had spread everywhere above the transverse colon and was apparently making its way below it, although he thinks the pelvis was not yet affected in any degree. The history of the case is instructive. For two days following perforation there was absolute constipation and the abdomen was generally swollen and tender, but especially so in its upper portion. The temperature was 103° F., pulse 132, respiration 30. Then a high enema brought away considerable gas and a small quantity of feces, and greatly relieved the patient. In a few hours pain and vomiting reappeared. She was given another enema, which again relieved her symptoms, and three hours afterward she had a large, natural, constipated movement of the bowels. Her temperature fell to 100° F. and her pulse to 90. As the abdominal tenderness and distention continued, and there was distinct resistance in the upper portion of the abdomen and absence of liver dulness, the diagnosis of gastric perforation was made and operation performed as above described.

Rouse¹ was called to see a girl, aged twenty years, with a history of chronic dyspepsia, who had been vomiting for twenty-four hours and had twice vomited blood. In spite of this she had eaten some steak-pie for supper. This act was followed by acute pain, hemorrhage, and collapse. Rouse diagnosed gastric ulcer with perforation, but operation was absolutely refused. He, therefore, treated the patient by nutrient and stimulating enemata, morphine, and hot fomentations. On the following day there were undoubted signs of peritonitis: pain and tenderness throughout the abdomen, muscular rigidity, a drawing up of the legs, typical facies, and a temperature of 102° F. Vomiting continued. A grain of opium was given by mouth every six hours. On the second day the vomiting was fecal in character. This continued until the fourth day. From that time she began to recover, and in seven weeks was well enough to be moved. Six months afterward she was perfectly strong and well, and digested ordinary food without difficulty.

¹ *Lancet*, 1902, vol. ii. p. 112

Moullin¹ reports a series of 19 cases of gastric ulcer; 5 of these patients were not operated upon, and all died, 3 from hemorrhage, 1 from perforation, and 1 from exhaustion. The other 14 patients were operated upon and 12 of them recovered. In 11 cases the chief symptom was hemorrhage. In most of the cases the ulcer was excised, but in 2 it was merely sutured, while in 3 others it was ligated or sewed through and through from the mucous surface of the stomach. Moullin does not advocate operation in every case of gastric ulcer, but he believes that many lives would be saved and much suffering would be avoided if operation were performed more frequently. In acute cases the indications for operation are threatened perforation or hemorrhage. Severe hemorrhage comes almost invariably from an erosion in the side of the wall of an artery. If a hemorrhage stops, it is because a clot has formed; if it recurs, it is because that clot has washed out. It is not wise to subject the patient to the risk of a repetition of this accident. In case of chronic ulcer the existence of the ulceration is sufficient reason for operation. Since 1897, 500 patients (98 men and 402 women) have been admitted into the London Hospital suffering with gastric ulcer. Deaths from perforation have occurred in nearly 10 per cent. of the cases; from hemorrhage in 2.5 per cent., and from other causes in 5.5 per cent. The total number of deaths has been 89, or 18 per cent. Nearly one-half of these patients had been previously treated in the hospital for gastric trouble.

Heaton² has collected all the cases of gastric ulcer with perforation operated upon in one or two large London or provincial hospitals during the last five years, and in which perforation was found and sutured. There were 40 such cases with 14 recoveries and 26 deaths—a mortality of 65 per cent. This mortality is higher than that sometimes given, but probably is nearer the truth.

Kellock³ reports the successful excision and suture of a chronic ulcer in the posterior wall of the stomach of a woman aged thirty-six years.

Gastro-enterostomy. Barker⁴ reports 10 successful consecutive gastro-enterostomies for benign *pyloric stenosis* or ulcer with hemorrhage.

Dalziel⁵ reports 30 cases of gastro-enterostomy for *non-malignant gastric disease*, with 1 death. The immediate effect of operation is, of course, of less significance than the ultimate effect. Fortunately, the late results were as satisfactory as the immediate results. Although patients in such condition are not in immediate danger of death, yet they suffer discomfort and pain after eating, and sometimes the emaciation is so extreme that they are unable to attend to any work. The

¹ British Medical Journal, 1902, vol. ii. p. 1650.

² Lancet, 1902, vol. ii. p. 17.

⁴ Ibid., p. 501.

³ Ibid., p. 96.

⁵ Ibid., p. 503.

gastro-enterostomy enables the stomach to empty itself completely and easily, so that accumulation and decomposition of the contents are no longer possible. The relief in most cases is immediate and permanent. Emaciation rapidly disappears, dyspepsia vanishes, and ordinary food can be taken with impunity.

In suitable cases this operation gives results as striking perhaps as those of any modern surgical procedure, and its mortality in skilled hands is certainly not more than 3 per cent. Both of the operators mentioned prefer posterior gastro-enterostomy.

Caird¹ has performed gastro-enterostomy twenty times for *cancer of the pylorus* with four deaths. In most of these cases he followed von Hacker in attaching the jejunum to the stomach behind the transverse colon. In no case was a vicious circle formed after operation. One patient died of exhaustion, 1 of bronchopneumonia, 2 of peritonitis. Of those who recovered 3 were lost sight of, 6 were known to be dead, and the remainder were alive for varying periods up to six years. The diagnosis of carcinoma in these cases was, of course, a clinical one. All of the patients who survived operation gained flesh rapidly, and in several instances the tumor shrank until it was no longer palpable.

Hall² has performed antecolic posterior gastro-enterostomy four times with success. He brings the loop of jejunum in front of the colon pretty well over to the left side, and has not observed any unpleasant tension upon it. The stomach is well drained, even when the patient lies on his back. An operation by this method is easily and quickly carried out, and it combines, according to Hall, the advantages of both the anterior and posterior methods.

Cordier³ performed gastro-enterostomy for *pyloric stenosis*, using a Murphy button. The button dropped back into the stomach and remained there until the death of the patient, nearly seven years later. It gave rise to no symptoms. The patient increased in weight from 115 pounds up to 180 pounds, and enjoyed perfect health, until the attack of acute pneumonia, which caused his death. The accompanying illustration shows the stomach and intestine dilated with air and the two halves of the Murphy button, one of which was partially destroyed by the gastric secretions or acid in the food. (Fig. 12.)

GASTRO-ENTEROSTOMY BY MEANS OF MCGRAW'S ELASTIC LIGATURE. In a recent paper read before the Section on Surgery at the New York Academy of Medicine,⁴ Dr. Lloyd reported 7 cases of gastro-enterostomy performed by this method without a single death.

¹ British Medical Journal, 1902, vol. i. p. 1268.

² Lancet, 1902, vol. ii. p. 744.

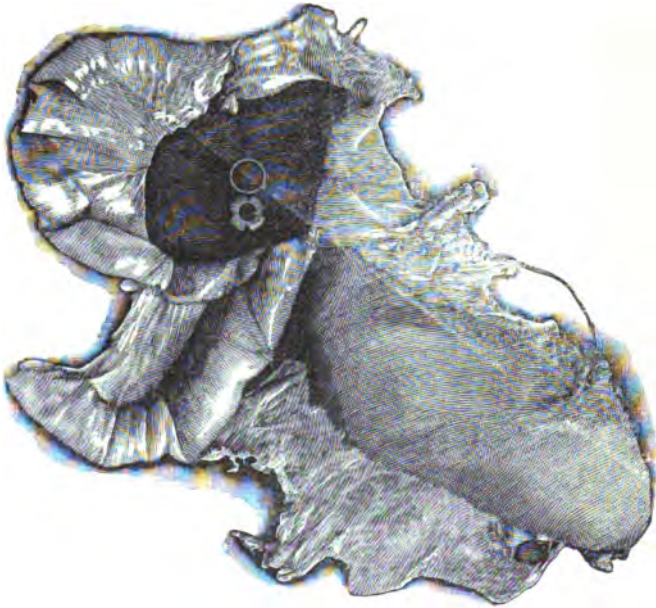
³ Journal of the American Medical Association, 1902, vol. xxxviii. p. 582.

⁴ Medical Record, January, 1902, p. 133.

He also mentioned 11 cases of operation by other men by the same method, making 18 cases with 5 deaths. Lloyd is a very strong believer in the advantages of this method over Murphy's button.

He advises placing a piece of strong silk along the line of sutures before the rubber suture is tied. Rubber is then tied over the silk and then the silk over the knot of the rubber. McGraw advises a hard, round, smooth elastic ligature 2 mm. in diameter. Dr. Lloyd thinks it better to have one slightly larger. The advantages of the method he believes to be: that there is no incision of the bowel, no loss of blood, no escape of feces, no exposure to peritoneal infection from the

FIG. 12.



Gastrojejunostomy (Murphy button). Patient died of pneumonia seven years later. Stomach is filled with air in this picture. Notice difference in size of distal and proximal ends of bowel; very little air in duodenal end.

escape of bowel contents. He states that feeding may be begun after forty-eight hours, although McGraw believes it wise to wait fifty-six hours.

The results reported by Lloyd are certainly remarkably good, and I believe that the method is likely to be much more generally adopted. It requires, however, a much larger series of cases to determine the relative value of the elastic ligature to the Murphy button. In the large statistics of Mayo, cited elsewhere, comprising 107 cases of gastro-enterostomy by means of Murphy's button with a mortality of

only 9 per cent., the results are so nearly ideal that it would be difficult for any new method to supplant the button.

Meyer¹ reports two cases of gastro-enterostomy performed with the aid of McGraw's elastic ligature. The ease of the operation and the clinical results are such that he expresses himself as convinced that this method is superior to all others for the production of intestinal anastomosis.

Terrier² reports excellent results with posterior gastro-enterostomy, having lost only 1 patient out of 22—a mortality of 4.54 per cent. He divides the transverse mesocolon between the vessels far enough to the left to preserve the freedom of the stomach, draws the nearest portion of the stomach through the opening thus made, attaches it by three stitches, and selects the first loop of jejunum. He recognizes this as a loop of intestine attached to the posterior wall of the abdomen by one end. This fixed end he leaves lying to the left, and makes his anastomosis 12 to 15 cm. (five to six inches) away from it. The assistant holds the stomach taut with two clamps, while the posterior row of seroserous stitches is inserted from left to right. The anterior row is started also from left to right. Then the incisions are made in the stomach and jejunum, their free edges sewed posteriorly from within their lumens and anteriorly from the outside. The anterior seroserous suture is then finished and the anastomosis is complete. The time required for the operation averages one hour. After the operation the patient is protected from shock, and in twenty-four hours he is allowed to drink milk and Vichy or weak wine. Gastric lavage is often employed to relieve unpleasant symptoms, such as acid regurgitation, eructations, or fever.

Mayo³ reports 107 gastro-enterostomies performed for malignant and benign causes with a total mortality of 9 per cent., or 6 per cent. in benign cases, and 20 per cent. in malignant cases. The causes of death were exhaustion in 3 cases, pernicious vomiting in 2 cases, pneumonia in 3 cases, and leakage in 2 cases. Mayo sometimes performs posterior gastro-enterostomy, but generally chooses the anterior method. If the patient is thin and has a long mesocolon the posterior anastomosis is performed. If the mesocolon is short and full of fat, and the loop of the superior mesenteric artery is small, the anterior anastomosis is preferred. The torn edges of the mesocolon are sutured to the stomach. In the anterior operation the anastomosis is covered with omentum, split, and sutured to the stomach as far up as an inch above the anastomosis. In the 2 cases in which leakage occurred the superior part of the union

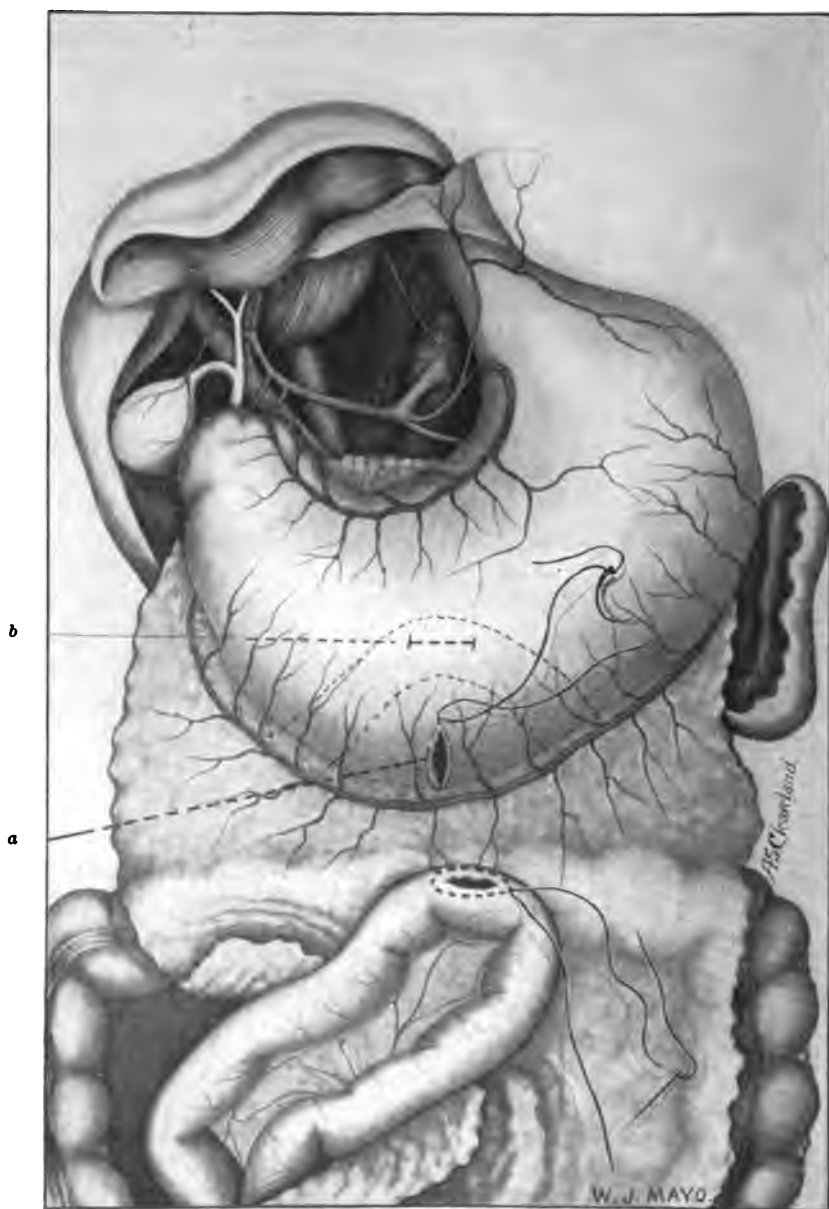
¹ Medical Record, January, 1902, p. 133.

² Revue de Chirurgie, 1902, p. 369.

³ Transactions of the American Surgical Association, 1902, vol. xx. p. 151.

gave way some nine or ten days after operation. At that time it would be a matter of indifference whether the anastomosis had been made

FIG. 13.



Proper and improper sites of opening in stomach in gastro-enterostomy: *a*, proper position, leaving no pouch; *b*, improper position, forming an intragastric pouch. (MAYO.)

with a suture or button, hence the necessity of protecting the suture line with omentum. Chlumsky's experiments on animals show that a suture of stomach or intestine is firmly united in five days, but in emaciated patients a much longer time may be necessary.

The examination of the anastomosed parts long periods after operation leads Mayo to the conclusion that an opening between the stomach and intestine, however made, will not be likely to contract if the pylorus is much obstructed; but that if the pylorus is free, for example, in gastro-enterostomy for gastric ulcer, there is often a contraction of the

FIG. 14.

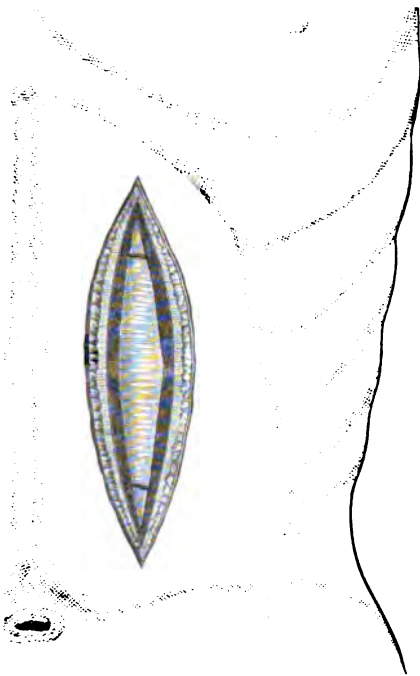
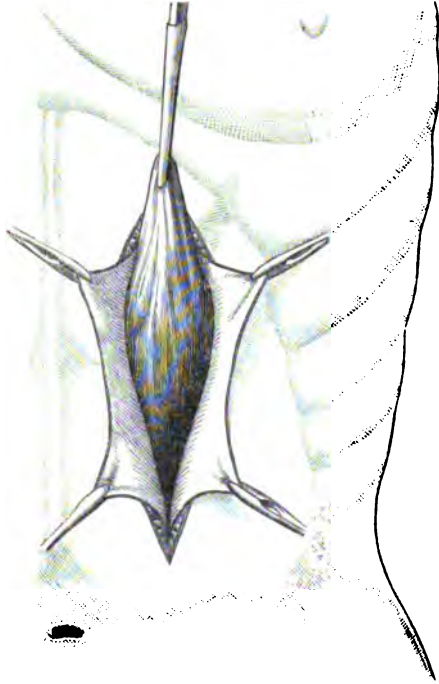


FIG. 15.



Gastrostomy; incision through abdominal wall.

Gastrostomy; the stomach drawn out.

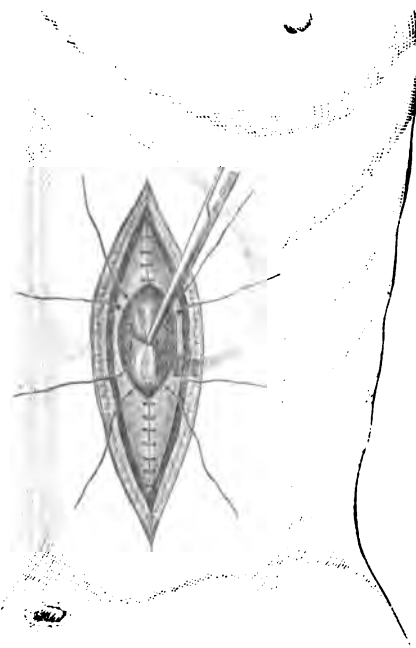
opening until it is not larger than a lead-pencil. It was at one time suggested that the gradual contraction of a dilated stomach would *pari passu* contract the opening, but further investigations have shown that such gastric contraction takes place to an insignificant extent.

Mayo emphasizes the importance of making the opening in the stomach at a point which will not invite the retention of fluids in the stomach. (Fig. 13.)

The length of the jejunal loop used for the anastomosis is important. If the afferent portion is too short spur formation and duodenal distention, vomiting, etc., is favored, while instances are on record in

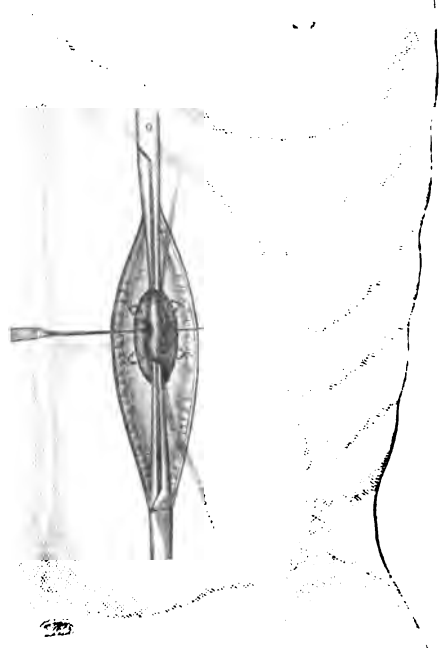
which strangulation of the rest of the small intestine occurred by passage around a presumably too long loop in anterior gastro-enterostomy. Robson says that in the anterior operation the loop should be twelve inches long, and a little shorter in the posterior method. Mikulicz places the lengths at 50 cm. (twenty inches) for the anterior and 15 cm. (six inches) for the posterior anastomosis. Mayo's average has been fourteen inches in the anterior operation and not less than ten for the posterior one.

FIG. 16.



Gastrostomy; first row of gastric sutures.

FIG. 17.



Gastrostomy; division of the serous and muscular coats before the second suture.

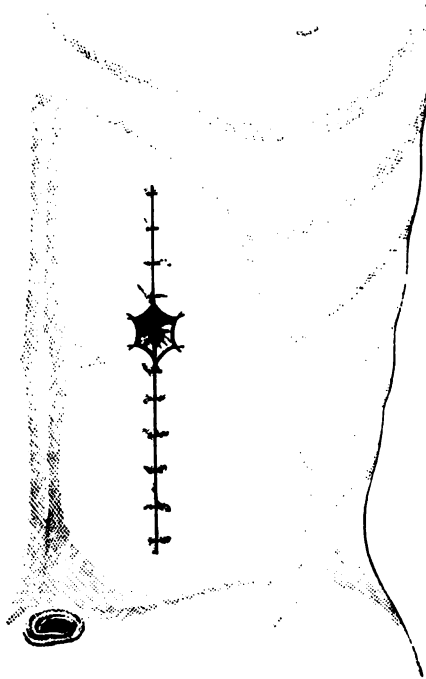
A New Method of Performing Gastrostomy. Terrier and Gosset¹ perform gastrostomy as follows: A long vertical incision splits the fibres of the right rectus muscle. (Fig. 14.) After the peritoneum is opened a long cone of stomach is drawn outward and upward. It is important that this cone shall be long and loose. (Fig. 15.) The serous and muscular coats of the stomach are stitched to the posterior sheath of the rectus muscle. (Fig. 16.) The serous and muscular coats are divided and their cut edges sutured to the anterior sheath of

¹ *Revue de Chirurgie*, 1902, p. 164.

the rectus muscle. (Fig. 17.) The mucous membrane is incised for the smallest possible distance, brought outward and stitched to the skin. (Fig. 18.) The skin is sutured.

Terrier claims for this operation that it is very easy of performance ; that it makes a canal from the stomach to the outside world, as long as the thickness of the abdominal wall ; that the stomach is fixed by three rows of sutures ; that the canal is surrounded by the strong uninjured rectus muscle, in addition to the normal muscular structure of the

FIG. 18.



Gastrostomy ; suture of mucous membrane to skin.

stomach wall ; that these muscular fibres form a sphincter to prevent the escape of fluids, and that the mucous membrane is sufficiently loose to act as a sort of valve. This operation has been performed eight times. Five times the canal was entirely continent. Once it was temporarily incontinent for a few days, but again became continent. Once it failed to control the gastric contents. This failure was due, so the operators thought, to too great tension on the stomach. One patient, greatly emaciated, died a few hours after operation, before the function of the canal could be tested.

A New Method of Pyloroplasty for Stenosis. Finney¹ describes a new method of pyloroplasty which is almost a lateral anastomosis

FIG. 19.

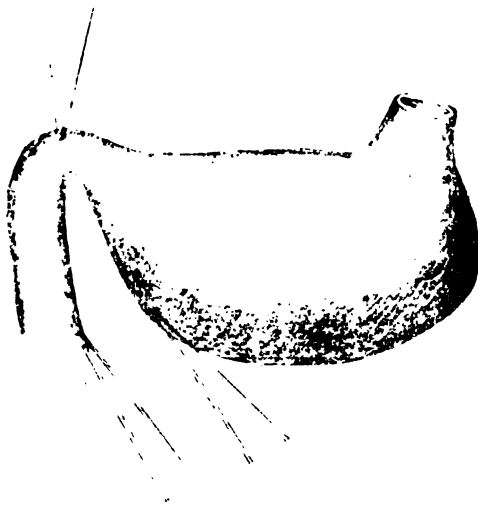
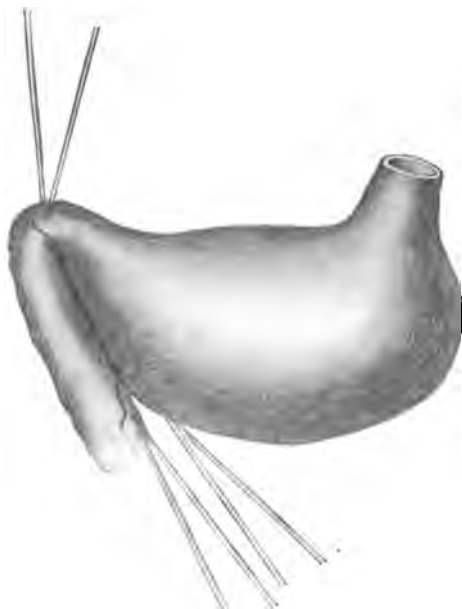


FIG. 20.



between the duodenum and pyloric portion of the stomach. The parts to be operated upon are first freed by division of adhesions. This step

¹ Bulletin of the Johns Hopkins Hospital, July, 1902.

is essential to the easy performance of the anastomosis. A stitch is inserted in the upper wall of the pylorus for the sake of upward contraction. A second stitch is inserted into the anterior wall of the

FIG. 21.

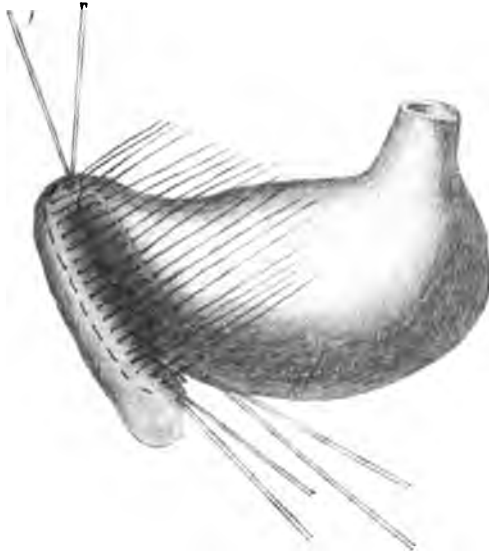
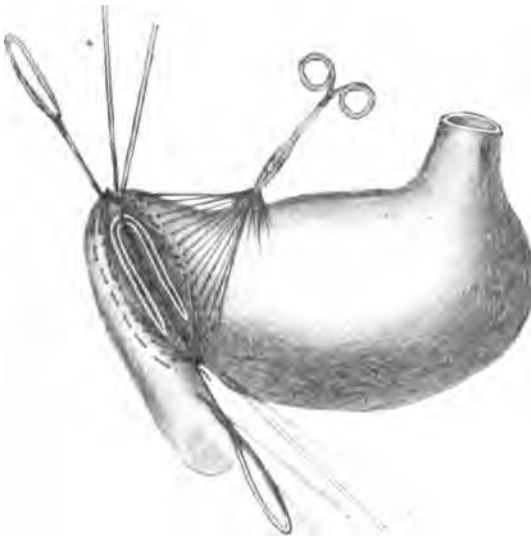


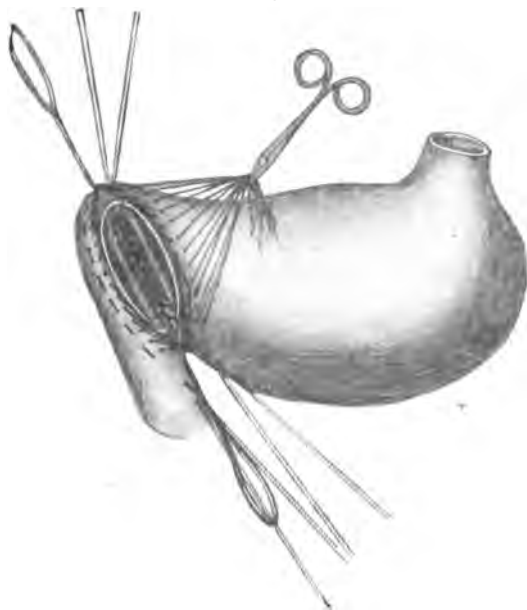
FIG. 22.



stomach about 12 cm. (4.8 inches) from the pylorus, and a third one in the anterior wall of the duodenum also about 12 cm. (4.8 inches) from the pylorus. (Fig. 19.) These stitches mark the ends of the

incision into the stomach and duodenum. When the stitch in the pylorus is drawn upward and those of the stomach and duodenum downward the parts are held taut in the proper position. A continuous posterior peritoneal suture is then inserted. (Fig. 20.) Next an anterior row of mattress sutures are inserted, but not drawn taut. (Fig. 21.) Instead they are retracted vertically in either direction so as to expose the line of incision. (Fig. 22.) As the parts are held the incision is of the shape of a horseshoe through the wall of the stomach, the pylorus, and around into the duodenum. Hemorrhage is controlled, scar tissue is excised, retaining edges of mucous membrane are trimmed away, and a continuous catgut suture is inserted through

FIG. 23.



all the coats of the stomach and intestine on the posterior side of the incision. (Fig. 23.) The anterior sutures are then disentangled, drawn out and tied, and the operation is complete. (Fig. 24.) The size of the newly-formed pyloric opening is limited only by the mobility of the stomach and duodenum; 12 cm. (4.8 inches) is long enough for practical purposes. For two or three days previous to operation the stomach should be irrigated night and morning with boiled water, and only sterilized food and water administered by mouth. No food is given for twelve hours before operation, and nothing for thirty-six or forty-eight hours afterward, except enemata of salt solution and coffee, which alternate on the second day with nutritive enemata.

In the report of St. Mary's Hospital at Rochester, Minn., for the year 1902, it is stated that 963 intraperitoneal operations were performed. Finney's gastroduodenostomy was performed 16 times with 12 cures, 3 improvements, and 1 death.

Results in a Long Series of Gastric Operations. An extensive work that has been published on the subject of benign diseases of the stomach is that of Petersen and Machol.¹ It covers a series of 104 cases operated upon between 1882 and 1901 at the Heidelberg Surgical Clinic (Czerny). In 8 of these secondary operations were later performed, and in 5 others extensive double operations were done; so that the total number of extensive operative interventions amounted to 120. *Gastro-enterostomy* was done 80 times, with 5 deaths—that is, *gastro-enterostomy* (with suture) once; *posterior gastro-enterostomy* 79 times, the button being employed in 65, suture in 14 of these cases.

FIG. 24.



Pyloroplasties (or *duodenoplasties*) were done in 11 cases, with 1 death; circular resection of pylorus, 4, with 2 deaths; excision for ulcers, 7, with 3 deaths; operations for gallstones in connection with *gastro-enterostomy*, 4, with *duodenoplasty*, 1, and *cholecystotomy* alone, 1; *gastrolyses*, 5; *gastro-enteroplasty* (or *enteroplasty*), 4; *divulsion* of pylorus, 1; *exploratory laparotomy*, 2.

The conditions that furnished the indication for operation in the foregoing cases were *stenosis* of pylorus or duodenum, 79; *atony*, 2; *gastralgia*, 18, and *hemorrhage*, 5.

The above figures show 11 deaths in the 115 single operations performed, or a mortality of 9.5 per cent. Death was due to *peritonitis* in consequence of faulty suture twice; to *hemorrhage* after excision,

¹ Beiträge z. Pathologie u. Therapie d. gutartigen Magenkrankheiten. Beitr. z. klin. Chir., April, 1902.

twice; to pneumonia, six times; to cachexia and chronic miliary tuberculosis, once.

Dividing their operations into two groups, making September, 1895, the dividing line, the first period covers 32 operations with 7 deaths (22 per cent.); the second period from September, 1895, to January, 1900, 83 operations with 4 deaths (4.8 per cent.). Only 2 of the 4 deaths in the latter group followed gastro-enterostomy, 1 being the case mentioned with miliary tuberculosis, the other, a man, aged sixty years, with cicatricial stenosis of pylorus with numerous complications.

According to whether or not the case complicated with miliary tuberculosis be counted, the authors state they have had a continuous series of 47 or 59 gastro-enterostomies without a death—a result which has not been equalled thus far.

The other 2 deaths in Group II. followed excision of an ulcer, and were the only 2 deaths within the last three (or four) years. They prove the unfavorable prognosis of this operation at least in advanced, cachectic cases.

Excluding these two excisions the other methods of operation show a continuous series of 56 (or 72 operations, respectively) without death.

The time of observation since operation in the cases that come into consideration for the estimation of permanent results was as follows:

Less than a year	10
From one to two years	19
From two to three years	10
From three to four years	15
From four to five years	6
From five to ten years	11
From ten to sixteen years	4

As regards the relative value of gastro-enterostomy and pyloroplasty, the writers state their opinion as follows:

1. In the great majority of cases pyloroplasty is inferior to gastro-enterostomy.

2. In a small minority of cases pyloroplasty is probably equal in value with gastro-enterostomy, but it is not superior to it. The selection of these cases is, however, often most difficult.

3. In view of the fact, therefore, that pyloroplasty in the most favorable cases offers but the same chances as gastro-enterostomy, they consider it more rational to employ but one method, namely, gastro-enterostomy, according to Hacker-Murphy.

Should it be found, they say, that jejunal ulcers are a frequent and not to be foreseen occurrence after gastro-enterostomy, this would speak in favor of pyloroplasty in certain cases. Furthermore, should it be shown that Murphy anastomosis shows more tendency to secondary

shrinkage than suture anastomosis, this, too, would influence their choice of operation.

As regards the technique of operation practised by them, and which they call special attention to, it is briefly as follows: The abdomen was opened either in the median line or by an incision in the middle of the left rectus. The abdominal wound was almost always closed by simple layer suture. Later examinations showed that this simplest method gives most satisfactory results after longitudinal incision in the upper half of the abdomen. Only in 7 per cent. of the cases slight ectasies were observed.

Posterior gastro-enterostomy was the method of choice (79), anterior gastro-enterostomy having been done but once in the entire series reported. Suture was employed in 14 cases, the button in 65, and since 1896 the latter has been used exclusively.

As to the topographical conditions of gastro-enterostomy and the rules resulting therefrom for the measuring and locating of the loop, it is shown that in gastro-enterostomy the lowest point of the stomach generally lies lower than the plica duodenojejunalis. Therefore, if the afferent loop is made no longer than the distance between the plica and anastomosis the efferent loop does not form a more or less acute angle with the efferent loop, but the anastomosed intestinal loop runs in a slightly curved direction from above downward along the posterior wall of the stomach. And inasmuch as the acute angle formed by the afferent and efferent loops furnishes the principal cause for the formation of a spur, the avoidance of this acute angle in the technique practised at the Heidelberg Clinic removes the main cause for spur formation and the resultant, much-dreaded ileus.

This was evidenced by the fact that in 215 posterior gastro-enterostomies serious trouble from regurgitation was not observed in a single instance.

With regard to the advantages of Murphy's button in operations for benign diseases of the stomach, Petersen and Machol emphasize the following points:

1. It shortens the time of operation by ten to fifteen minutes—a factor of great importance with cachectic patients, and more important yet in cases of profuse hemorrhage.

2. Its safety and reliability, as evidenced by the fact that in 215 cases of posterior gastro-enterostomy in which the button was used anastomosis has been perfect. It is doubtful, they say, whether a similar series of suture anastomoses with equally good results is to be found.

3. It facilitates asepsis, as the lumen of stomach and intestinal loop remain open for but a short period of time.

4. It tends to ensure proper functioning of the fistula.

5. It facilitates the feeding of the patients within the first days after operation.

They do not advocate the use of the button in cases where anterior gastro-enterostomy has to be done.

On the other hand, the writers fully admit the shortcomings of the button, inasmuch as it always must remain a foreign body, and hence may give rise to numerous secondary disturbances. A resorbable button would probably overcome all these difficulties. However, the buttons of this kind so far placed upon the market do not answer the necessary requirements as to safety, reliability, and complete resorption.

Gastroptosis. Coffey¹ suggests that the omentum be stitched to the anterior abdominal wall to make a hammock for the support of the stomach in cases of gastroptosis. By using eight interrupted chromicized catgut sutures he was able to fix the omentum for a distance of six inches across the abdomen.

Dilatation of the Stomach. Banks² cured a patient of gastric dilatation without pyloric stenosis by turning a fold into the lumen of the organ measuring about six inches in length and three in width. A number of operations of this character have been reported, but, unfortunately, the report has usually been made a short time after the operation, so that little is known as to the permanence of cure. Banks saw his patient two years and a half after operation, and ascertained that he had no relapse into his former dyspeptic condition. He refers to a case in which operation was performed by Moynihan, and in which the patient was well seven years after operation, and another in which operation was performed by Maylard in which the patient was quite well four years after operation. These cases and others in which cure was reported at shorter intervals show that gastroplication can cure a badly dilated stomach if there is no pyloric stenosis. This fact should be ascertained as soon as the abdomen is opened, not by cutting into the stomach, but by invaginating its dilated wall at a sufficient distance from the pylorus so that the surgeon's finger will readily pass into this outlet.

Carcinoma of the Stomach. GASTRECTOMY. Vander Veer³ reports an operation of this character in which the whole stomach was removed and the duodenum was literally attached to the œsophagus by means of a Murphy button. In order to relieve the tension upon the

¹ Philadelphia Medical Journal, October 11, 1902, p. 506.

² British Medical Journal, 1902, vol. ii. p. 1400.

³ American Medicine, October, 1902, p. 651.

œsophagus lateral incisions were made along it. These failed, however, to accomplish the desired result; the upper segment of the Murphy button loosened from the œsophagus and allowed the escape of fluids into the peritoneal cavity. The patient died on the day following operation.

In another case Vander Veer was able to leave about two inches of the cardiac extremity of the stomach, which greatly facilitated the suture to it of the duodenum. The patient made a complete recovery, and six months later had gained over thirty pounds in weight. He was at that time in thoroughly good condition, and was working at his trade as a blacksmith. The tumor was found to be a round-celled sarcoma with metastases in neighboring lymph glands.

Syme¹ reports a successful case of gastrectomy for a case of *carcinoma of the pylorus and lesser curvature*. The tumor was of the infiltrating type, and was not very far advanced. No enlarged glands were observed. The organ was so movable that it could be brought outside of the abdomen, and incisions were made between clamps and ligatures, and the cut ends were sutured.

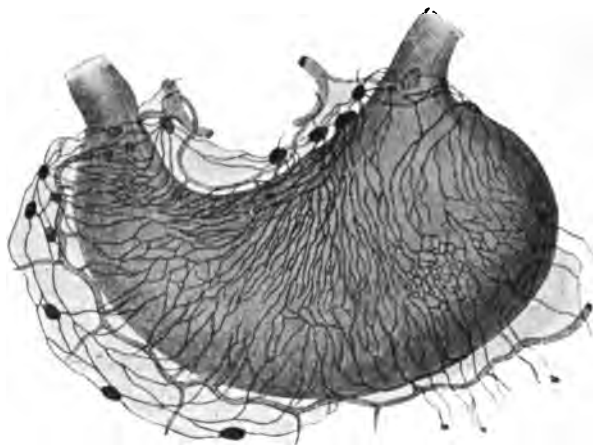
In operations of this character the operator often speaks of removing the whole stomach and attaching the duodenum to the œsophagus. If there is an abdominal portion to the œsophagus it is only about an inch long, and as the situation of the œsophagus is at least midway between the surface of the stomach and the skin of the back a considerable part of the cardiac portion of the stomach must be left in every case in which the division of the organ is made outside of the abdomen. This is, of course, of great importance for the patient after recovery from an operation, since even a small portion of stomach will form a receptacle for food. Thus, Syme's patient in four weeks after operation was said to be eating ordinary food in quantities to which she was accustomed before operation. Such a result would probably be impossible if it were literally true that the duodenum and the œsophagus were united, the whole stomach being removed. It is just as well to be exact in such statements. There certainly is just as much honor in curing a patient by a partial gastrectomy as there is in removing the whole stomach, although at the present time the latter seems to be the ideal striven for.

The attention should not be centred solely upon the condition of the stomach in performing partial or complete gastrectomy. For carcinoma the condition of the neighboring lymph glands is at least as important as that of the stomach; indeed, upon the possibility of

¹ Lancet, 1902, vol. ii. p. 735.

removal of affected glands must rest in many cases the decision for or against radical operation. Mikulicz¹ has had great experience in these cases, and has brought the technique of the operation to a high state of

FIG. 25.



The subserous lymphatic system of the stomach together with the first groups of lymphatic glands. (STAHR.)

FIG. 26.



The second group of lymphatic glands of the stomach situated along the pancreas and close to the coeliac axis and splenic vessels. (STAHR.)

perfection. He finds that the lymphatic glands which directly receive the lymph from the stomach are situated around the pyloric orifice along the pyloric half of the greater curvature, along the lesser curva-

¹ *Handbuch der Practischen Chirurgie*, second edition, vol. iii., part i., p. 317.

ture, and around the cardia. The lymph vessels of the fundus of the stomach drain into a few glands situated near the organ, but they drain chiefly into larger lymphatic glands near the spleen. (Figs. 25 and 26.) The lymphatic current is such that the glands along the lesser curvature and around the cardia are early involved even when the growth is situated in the pylorus, but the removal of all these glands is technically possible. The removal of the pancreatic glands is far more difficult on account of their intimate relation to large vessels, to the common duct, and to the pancreas itself; consequently, if they are extensively involved a radical operation is impossible. No radical operation should be attempted if the lymph glands around the portal vein in the retroperitoneal tissue or in the mesocolon are the seat of metastatic deposits. When Mikulicz operates he attempts to remove not only the enlarged lymphatic glands, but as far as possible the tissue in which they are placed. This is important even though the tumor in the stomach requires the removal of a comparatively small portion of that organ. He first separates the lesser omentum from the part of the stomach to be resected, clamping the central ends of the branches of the coronary artery and ligating the peripheral portion. The lesser omentum is then secured by a mass ligature above and a clamp below and divided between the two. Tension on the ligature makes it possible to dissect the lesser omentum still farther toward the cardia. The vessels, and especially the posterior ones, are ligated before they are divided. Finally a permanent mass ligature is applied to the stump of the lesser omentum, which is cut off close to the ligature. Removal of the pancreatic glands is more difficult on account of their deep situation and their close relation to important structures, so that if they are extensively involved radical operation should not be attempted. Resection of the isolated portion of the stomach follows.

EARLY DIAGNOSIS OF CARCINOMA. Gluzinski¹ says that the diagnosis of carcinoma of the stomach can be made with exactness in an early stage of the disease by following these simple rules: Gastric fluids are drawn off three times in one day, first while fasting, then forty-five minutes after a test breakfast of white of egg, and then four hours after a test dinner of beefsteak. These tests are to be repeated on two or three occasions separated by an interval of a few days. In simple round ulcer of the pyloric portion there will be found plenty of free hydrochloric acid in every test fluid. Absence or marked diminution of hydrochloric acid from even a single test, while present at other tests, is a sign of mucous catarrh. This is a suspicious sign of early carcinoma, and in conjunction with clinical symptoms will suffice for a

¹ Mitt. a. d. Grenzgeb. d. Med. u. Chir., vol. x.

diagnosis. The next stage of the disease is that of achylia gastrica. Lactic acid does not appear till late, too late to be of service in making a diagnosis for radical operation.

Mayo¹ emphasizes the advantage to diagnosis of simple inflation of the stomach by means of a Davidson syringe and stomach tube. Some air can be pumped in or some allowed to escape, and the distention thus obtained is more reliable and less painful than distention with effervescing powders. Not only is the outline of the stomach clearly shown, but not infrequently a hidden tumor is brought forward within reach of the palpating hand. It is not a method of examination which will supplant the more accurate tests of the trained specialist, but it is one which is recommended to the average practitioner.

EXPLORATORY OPERATION FOR DIAGNOSIS. When Mayo opens the abdomen and finds malignant conditions which are not susceptible of treatment, he closes the strong fascial layers with permanent buried sutures of silk or silver-wire so that the patient may get up at once and be allowed to leave the hospital in a few days. If kept in bed a long time these enfeebled patients will die before they are able to return home. In more than thirty exploratory operations of this character performed during the past ten years there has been no fatality from the operation.

Radical Treatment of Gastric Carcinoma. *Pylorectomy* as performed by Billroth years ago was a terrible operation, with a mortality of 55 per cent. Billroth himself recognized it as such, for he said, "All of the patients left the operating-room in shock, from which some of them recovered." Billroth sutured the duodenum into the angle of the gastric wound, and leakage often occurred where the three suture lines met. Kocher improved the technique by closing the gastric wound and inserting the duodenum in another portion of the stomach. Mayo closes both the stomach and duodenum and performs *gastro-jejunostomy*. This operation he has performed twenty times with two deaths, or a mortality of 10 per cent. His technique is as follows:

Through a median incision, having its inferior angle at or slightly to the left of the umbilicus, the stomach is exposed, and the gastrohepatic omentum tied as far to the left as the gastric artery. This mobilizes the diseased part, and by passing the fingers behind the pylorus into the lesser cavity of the peritoneum, the gastrocolic omentum can be tied off without danger to the superior mesenteric artery. A gauze pad is drawn under the freed part, and a heavy clamp placed on the

¹ New York State Journal of Medicine, 1902, vol. ii. p. 314.

duodenum, with sufficient force to form a groove. A catgut ligature is tightly tied in this groove, and a clamp placed between it and the stomach and the duodenum divided just beyond the ligature. A silk purse-string suture about the duodenum, three-quarters of an inch below, enables the tied end to be invaginated in a similar manner to the stump of the appendix. The stomach is turned up and to the left, and heavy clamps placed an inch from the growth. In the sulcus formed by the pressure a continuous catgut shoemaker's stitch is placed, using one thread with a needle at each end. The diseased part is then severed and a continuous silk Cushing suture rolls in the first suture line. Independent gastro-enterostomy with the Murphy button is then performed, either upon the anterior or posterior wall of the stomach, as preferred. The operation is quickly done, without loss of blood or opening the stomach.

Thus far there have been comparatively few instances of radical cure after pylorotomy for cancer. One of Mayo's patients died three years and five months after the operation from secondary involvement of the liver. No other one has lived three years, but several were in apparent good health at shorter intervals. Still, if the immediate effects are so good a possible late recurrence is usually no contraindication for operation. His clever summing up of the surgeon's attitude is worth repeating :

"Let us put this question to the practitioner of medicine: Can you cure a case of cancer of the stomach? If not, why withhold the only known means of effecting such a cure—a surgical operation? Again, let us ask: Can you diagnose cancer of the stomach early enough for surgical relief? If not, why withhold an exploration—the only certain means of diagnosis?"

Krönlein¹ finds from the examination of the histories of 209 patients having carcinoma of the stomach that death occurs in twelve months on the average after the commencement of symptoms in patients who are not operated upon. Gastro-enterostomy prolongs life for an average period of three months; gastrectomy for an average period of fourteen months. The average duration of the disease before the patients applied for treatment was nine months. Of 146 patients who had been operated upon only 22 were living at the time of report, from one to eight years after operation. Gastro-enterostomy was the operation in 9 of these cases, and gastrectomy in the remaining 13 cases. In spite of this very gloomy showing, Krönlein believes in operating, as it invariably gives the patient new life and hope, and there is always a slight chance that the disease may be permanently eradicated.

¹ *Archiv f. klin. Chirurgie*, 1902, vol. lxxvii.

THE INTESTINES.

Congenital Obstructions. Lillienfeld¹ was called upon to treat a child which from the hour of its birth vomited greenish-black material and was unable to retain any food. The child was poorly developed, but appeared perfectly formed, and its anus and rectum easily admitted of the passage of a rubber tube. The abdomen was opened to the right of the median line. The small intestine ended blindly about 75 cm. (30 inches) below the duodenum. It was, of course, very much distended by meconium. Tracing the small intestine up from the cæcum it was found to be normal for a little way, and then to pass into an impervious cord which had no connection with the blind upper end. This cord was resected, and as the condition of the child did not warrant an anastomosis the upper end was brought into the wound and opened. The child died about fourteen hours afterward, no meconium having discharged from the artificial anus. The explanation for this seemed to be the absence of peristaltic action in the greatly dilated intestine.

A similar case was reported by Hensch in 1899. In his patient the two blind ends of intestine were connected by a solid cord about 7 cm. (2.8 inches) long and as thick as a knitting-needle.

Ileocolic Invagination. Travers² was able to reduce at operation without opening the bowel fourteen inches of ileum which had become invaginated into the colon of a boy aged ten years. The cause of the trouble seemed to be a short Meckel's diverticulum which at some previous time had become inverted into the bowel, forming a polypoid mass which almost completely obstructed its lumen. The diverticulum was everted as fully as possible, although the œdema of its walls interfered with this to a certain extent. The boy made a good recovery. The diagram gives a good illustration of the existing condition (Fig. 27).

It is worth mentioning that although there was considerable vomiting for two days there was no passage of blood or mucus from the rectum, nor any tenesmus, apparently because the large intestine was not involved in the intussusception.

It is difficult to understand why the surgeon did not resect the diverticulum in this case. As he was not able fully to evert it the recurrence of an intussusception seems only a question of time. The necessity for resection was not so marked in two cases mentioned by Moore.³ In one of these fecal matter was discharged from the umbil-

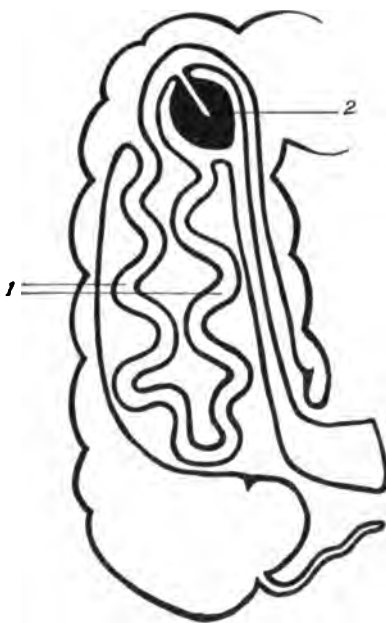
¹ Deutsche Zeitschrift f. Chirurgie, 1902, vol. lxii. p. 617.

² Lancet, 1902, vol. ii. p. 146.

³ Journal of the American Medical Association, 1902, vol. xxxix. p. 810.

icus of a baby aged seven months. This was due to the persistence of the vitello-intestinal duct. The diverticulum in this case projected from the small intestine at a right angle and was about two and a half inches long. The condition of the child made it imperative to terminate the operation as quickly as possible, hence the opening in the apex of the diverticulum was closed by a Lembert suture and the bowel reduced. The child recovered, and the likelihood of future trouble referable to a free diverticulum is, of course, only slight. In another patient operated upon by Moore the remains of the blood-vessels extending from the tip of Meckel's diverticulum to the mesentery

FIG. 27.



1. Invaginated ileum. 2. Meckel's diverticulum inverted into ileum.

made a loop through which ten inches of small intestine had passed and had become strangulated. The removal of this band relieved the strangulation and resection of the diverticulum was not attempted on account of the precarious condition of the patient. This patient also recovered without further trouble.

In more than one case an inflamed diverticulum has been mistaken for appendicitis. Another point of importance is the danger of mistaking an attenuated diverticulum for a simple intestinal obstruction. The diverticulum is, of course, a hollow tube, and should be ligated before section the same as an appendix.

The importance of early diagnosis of intussusception in children is evident enough. Ruber¹ says that it may be recognized, first, by the characteristic colic; then by more or less change in the child's face; next, by vomiting and the passage from the anus of more or less blood-stained mucus. By this time there are some symptoms of collapse. There will also be present a fulness in the right iliac fossa, more marked during the attacks of colic. If the physician bears these symptoms in mind he can hardly fail in making an early diagnosis of the trouble.

The Appendix as a Drainage Tube. Weir² has utilized the appendix as a drainage tube for the purpose of irrigating the colon in a case of bad colitis. He performed laparotomy, expecting to open and stitch the cæcum in the wound, but decided to employ for this purpose the freely movable appendix. A rubber catheter was passed through the appendix into the colon, and the irrigation carried out with success.

Perforation of the Duodenum. Murphy and Neff³ report a successful operation for perforation of the duodenum due to ulcer. The diagnosis made was that of appendicitis, and the case is another illustration that it is better to operate with a correct general diagnosis (in this case perforative peritonitis) than it is to wait for a exact diagnosis. The operation was performed eight hours after the onset of symptoms. The writers also cite eighteen additional cases besides their own, which makes a complete record of the cases of duodenal perforation treated by operation since Weir and Foote⁴ published their paper with a full list of cases in 1900. Murphy and Neff say that the diagnosis of perforating duodenal ulcer is practically impossible without an exploratory laparotomy. While the most of the published reports of cases up to the present time seems to justify this view, yet a correct diagnosis has been made in a very few instances, and it is as probable as anything in surgery can be that as attention is directed to this subject the condition will more often be differentiated from other kinds of intestinal perforation. Differential diagnoses are now made almost daily in cases of appendicitis, gastric ulcer, cholelithiasis, and even in diseases of the pancreas which a few years ago were quite impossible.

Periduodenal Abscess Secondary to Ulcer of the Duodenum. Bainbridge⁵ reports a case of ulcer of the duodenum followed by perforation and then by abscess involving the head of the pancreas, extending behind the stomach to the left and working down back of

¹ Medical News, New York, November 29, 1902.

² Medical Record, New York, August 9, 1902.

³ New York Medical Journal, September 20 and 27, 1902.

⁴ Medical Record, New York, May 5, 1900.

⁵ Medical News, 1903, vol. lxxxii. p. 433.

the descending colon. A probable diagnosis of perforating duodenal ulcer was made when Bainbridge first saw the patient, a month after his attack began, but his condition at that time did not warrant operation. As a diagnosis of duodenal perforation has rarely been made during life, the symptoms in this case are worth consideration. The attack began with severe vomiting and intense abdominal pain following immediately upon the drinking of a glass of ginger ale. There was more or less abdominal tenderness and rigidity, most marked in the epigastric and right hypochondriac regions. There was no increase of temperature, the pulse was 84, and the respiration was only slightly less deep than usual. For two days there was frequent vomiting of watery fluid and of any nourishment taken. In six days the patient was able to walk about. During three weeks following the patient took very little food and was given a good many nutrient enemata, but there was progressive loss of strength, though still without fever except on two occasions, and then only for a short time. He died of exhaustion in the eleventh week of the disease.

By a careful search through the literature Bainbridge was able to find only ten similar cases, six of them occurring in females—a fact quite at variance with the popular idea that duodenal ulcer is almost exclusively found in males. In most of the cases of duodenal ulcer followed by abscess perforation has been in some portion of the duodenum not covered by peritoneum, although in certain circumstances a perforation through the peritoneum may lead to a circumscribed abscess. While the symptoms of duodenal abscess following perforation are not as striking as those of perforation into the general peritoneal cavity, the course of the disease is far less rapid, so that there is much greater opportunity for a correct diagnosis and treatment.

In the *British Medical Journal*, January 10, 1903, D'Arcy Power reports 4 cases of acute perforating duodenal ulcer; 3 died and 1 recovered. The patients were all males, aged forty-one, forty-seven, thirty-seven, and twenty-six years, respectively. In the successful case the symptoms began suddenly, fifteen hours prior to operation. The condition was believed to be acute appendicitis, and the abdomen was opened in the right iliac region. Gas, together with a large quantity of thin fluid, escaped. This opening was closed and a median incision made. After a systematic examination of the small intestine a circumscribed hole was found in the first part of the duodenum. This was closed by Lembert sutures; drainage was established below the liver and in the rectovesical pouch and in both flanks. The patient made an uninterrupted recovery. Nutrient enemata were given every four hours for ten days after the operation. The bowel was flushed with plain water twice every twenty-four hours. A soap-and-water

enema was given on the sixth day; three grains of calomel by the mouth on the eighth day.

From a study of these four cases D'Arcy Power concludes that :

1. Duodenal ulcers occur more often in men than in women.
2. The extravasated fluid trickles into the iliac fossa, causing a local peritonitis, which may be mistaken for an acute appendicitis.
3. The transparent or bile-stained succus entericus found in the peritoneal cavity is diagnostic of a perforated duodenal ulcer. It is quite different from the gastric contents escaping at a perforated ulcer of the stomach.
4. The prognosis of a duodenal ulcer is worse than that of a perforated gastric ulcer on account of the greater difficulty in closing it satisfactorily.
5. The prognosis should not be too sanguine until after the lapse of the eighth day, and it is always bad, however well the patient may appear, if the pulse rate continues rapid. The pulse is a much better guide than the temperature.
6. Free drainage is imperative; both iliac fossæ, the rectovesical pouch, and the space below the liver more particularly need tubes. It is better that the patient should recover with a scarred belly than that he should die with an abdomen full of pus.
7. The feeding of the patient is a matter of great importance. Small quantities of food should be given frequently, and if the patient feels sick the amount must be reduced at once. It is better to give nutrient enemata for some days after the operation than to administer food by the mouth.

In view of the rare occurrence of a cure after operation for peritonitis due to perforation of a duodenal ulcer, the following case, reported by Blecher in the August (1902) number of the *Deutsche Zeitschrift f. Chirurgie* may be of interest:

The patient, a man aged thirty-one years, with good family and personal history, was referred to the hospital on June 5th. He had had retention of feces and gas since June 1st, the last two days accompanied by vomiting. Nevertheless, he had been able to perform his duties as a soldier up to the morning of the 5th. At that time his pulse was 68, temperature 36.5° (97.7° F.), tongue moist. Abdomen above umbilicus slightly drawn in, below the same bulging forward hemispherically; no resistance on palpation, which was slightly painful all over; tympanites. The differential diagnosis rested between peritonitis and intestinal occlusion, and the latter was decided upon.

The treatment consisted in several injections of two quarts of water, which forced out some scybala in the beginning. No change having occurred by afternoon, laparotomy was performed. On opening the

abdominal cavity in the median line feces together with moderate amounts of a brownish fluid of non-fecal odor were evacuated. The loops of small intestine that lay in the wound were reddened and flakes of fibrin were found scattered over the same. The appendix was adherent, much reddened, and covered with a fibrinous coat, but not perforated; it was amputated. On dissection it showed thickening of the walls and a fecal stone impacted in an abscess of the mucous membrane. On lengthening the incision to the ensiform process an opening, $1 \times \frac{1}{2}$ cm. in size, was seen in the upper portion of the duodenum, about a finger's breadth from the pylorus, the surrounding parts being distinctly infiltrated. With every expiration a gush of bilious fluid was evacuated. The abscess was covered by two layer sutures and the abdominal cavity cleansed by means of compresses dipped in tallow solution. A layer suture was used for the peritoneum, and a tampon put in the upper angle at place of suture. In the evening 100 c.c. of saline solution was given subcutaneously. These infusions were given daily, nothing being given per os. On June 7th there was spontaneous passage of gas; on the 10th the first stool occurred. Then feeding by mouth was begun, Leube's diet for ulcer treatment being chosen. On the 11th the saline infusions were discontinued. There was but little secretion from the abdominal cavity, and on the tenth day the tampon was removed. Eight weeks after operation the wound had almost completely healed; the patient was well and able to eat everything.

Blecher states that thus far there have been but five cures after operation for peritonitis due to perforation of a duodenal abscess.

Intestinal Perforation in Typhoid Fever. In last year's article on abdominal surgery the technique of the treatment of typhoid perforation was discussed. Further experience in this field makes it possible to form some idea as to the best time for operation, the best anæsthetic to be used, and to form some idea as to the percentage of recoveries that may be hoped for. Hays' reports seven operations. In five of these patients the incision was made in the median line below the umbilicus. Afterward this operator made use of an incision in the right semilunar line, which he prefers, because the perforation is often close to the cæcum, and in this situation a two-inch incision will usually suffice. It also affords easy inspection of the appendix, and if a fecal fistula results it is conveniently cared for. Hays believes in flushing the abdomen with a hot saline solution and inserting a glass drain through the wound into the pelvic region. The patient is placed in a bed the head of which is raised twelve or fifteen inches, and the fluid which

¹ American Medicine, September 6, 1902, p. 379.

collects in the pelvis is removed by aspiration. Three of these patients recovered (43 per cent.).

McRae and Mitchell¹ report seven operations for typhoid perforation with two recoveries. Cocaine was the anæsthetic, supplemented in the first cases by whiffs of chloroform. The incision preferred is through the rectus muscle. No flushing was employed, but the coils of intestine were wiped with moist gauze and the abdomen was drained with gauze.

Other complications of a surgical nature occurring in typhoid fever are mentioned by these writers. There occurred in a series of 275 patients furunculosis 13 times, periostitis of the clavicle twice, perichondritis of the thyroid once, enlarged cervical glands once, mastitis three times, abscess of the liver once, cholecystitis five times, appendicitis once, and interstitial perforation eight times, twice after intestinal hemorrhage. Seven of these eight patients were operated upon as stated above. The eighth died without operation. Exploratory operation was done in two cases. One of these patients had intestinal hemorrhage from which he died, and the other a low grade of peritonitis from which he recovered. Eleven other patients had symptoms suggestive of abdominal complications, but not sufficiently definite to warrant operation. Two died, and were shown at autopsy not to have had perforation. The other nine recovered. "It is well to realize that perforation comes under many guises, and that to attempt its recognition from any constant combination of signs is hopeless. No symptom is constantly present, and no significance should be attributed to the absence of any one. There are, however, certain points which stand out, and of these a most important one is the onset. This is usually sudden and with pain. Such an occurrence should excite suspicion. In patients who have had pain for days before the perforation there may be an exacerbation of the pain which attracts attention, or there may be nothing more striking than before. Other symptoms may accompany the pain, such as nausea or vomiting, sweating, rise in pulse rate, etc., but the pain is by far the most constant feature. Other conditions causing abdominal pain have always to be excluded most carefully."

The time between perforation and operation in Hays' successful cases was four and one-half, five, and eight hours, and in the fatal cases six, twelve, twelve, and twenty-four hours. At Johns Hopkins the elapsed time in the successful cases was seven and thirteen hours, and in the fatal cases it was three and one-half, eight, nine, twenty-five, and twenty-six hours. The proposal formerly made to delay operation until shock is less finds here no support.

¹ American Medicine, September 6, 1902, p. 369.

Dauriac¹ advocates surgical treatment in severe cases of typhoid fever. In one case he established an artificial anus in the jejunum just above the ecchymotic areas which mark the presence of severe ulcers. The lower bowel was daily washed out. The effect of operation was to reduce a high fever so that the patient was eating lamb chops seven days later. The intestinal opening was closed in five weeks.

Gunshot Wounds of the Intestine. Sir William Thomson,² quoting from Surgeon-General Sternberg's report of the United States Army, says that during the two years 1898 and 1899 there were 116 perforating wounds of the abdomen, of which 81, or 70 per cent., were fatal, and of 10 cases in which laparotomy was performed 9 died. Sir William Thomson states that he knew of a series of 9 cases in South Africa, with 1 recovery. Dr. Neale reported a case from Frere, South Africa, in which fifteen inches of the intestine were resected and the patient never had a bad symptom.

Dr. Robinson has published the statistics from the Philippine war, showing 45 cases of penetrating wounds of the abdomen, with a mortality of 48.9 per cent., of which 8 were killed or died within the first twenty-four hours, while of 30 cases not operated upon only 10 were fatal, showing in this group a mortality of but 33.3 per cent.

Thomson states that he has seen or treated many cases in which the track of the bullet made it almost a certainty that it had passed through the bowel, and in which the patient presented absolutely no symptoms up to his discharge from the hospital. He asks the question: "Are we justified in opening the abdomen in such a case as soon as we see it with no other evidence than two external openings and a belief that the bowel cannot have escaped?" He adds that "there can be no doubt that after a prolonged search for wounds in the intestine, which did not exist, the patient's chances of recovery would be much on the wrong side." He goes further and asks the question: "Is it possible for recovery to take place in cases in which there is actually a wound of the intestine?" and answers it by saying that he is quite satisfied that in very many instances of this injury from the Mauser or Lee-Netford bullet the patients survived. Some of them even had bloody stools and other symptoms leaving no doubt as to the nature of the injury.

The conclusion he arrives at after a most careful study of the subject is that, considering the difficulty of diagnosis in many instances at the outset, the fact that intestines may be found unwounded, and if wounded may be occluded by natural processes if not interfered with, it seems evident that in war under present conditions the man whose abdomen

¹ *La Presse Médical*, July 23, 1902.

² *Surgical Lessons from the South African Campaign*, *Lancet*, August 3, 1901.

is perforated by a small-bore bullet has a better chance of life without operation than with it, considering the circumstances under which laparotomy must be performed on the field.

Gunshot Wounds of the Abdomen. In regard to the treatment of gunshot wounds of the abdomen, the practical experience of Mr. Charles Roberts, of the Manchester Royal Infirmary, recent civil surgeon in the South African Field Force,¹ is of considerable interest. He states that in considering the cases in which operative interference is required we must first exclude those wounded who will die in the first twenty-four hours from intraperitoneal hemorrhage, or from the shock of the extensive internal injuries and who are not amenable to surgical treatment. This number he considers to be from 20 to 30 per cent. of those wounded. He believes that with increasing peritoneal hemorrhage which threatens life, and the surroundings and general condition of the patient permitting, laparotomy should always be performed and the bleeding arrested. He believes that wounds of the liver, kidney, and spleen, as a rule, heal well when hemorrhage is not dangerous. He thinks that laparotomy may be required if perforation of the stomach and bowel may have taken place. He states that if we exclude those who die in the first twenty-four hours we may estimate that of the cases of penetrating abdominal wounds amenable to surgical treatment about 60 per cent. will recover. While he does not believe in routine laparotomy, he thinks it should be performed if the first evidence of perforation exists. The results of laparotomy in gunshot wounds in the recent wars have been extremely unfavorable. In the Spanish-American War, Senn reported that all cases he knew of that were operated upon died. In the Tirah campaign 8 cases of penetrating wounds of the abdomen were observed, and the 5 in which operation was performed all proved fatal. Roberts states that in the Boer war he knew of but two successful operations for wounds of the small intestine. In the American war in the Philippines, Dr. Robinson reported 5 cases that were operated upon and 4 died. Roberts attributes these unfavorable results to the severity of the injuries, delay in bringing in the wounded, difficulty of transport, and the general unfavorable surroundings which obtain on the field of battle. His conclusions are:

1. As a rule, the conditions in the field hospitals are not such as to warrant the performing of laparotomy. Moreover, many patients with penetrating abdominal wounds recover without operation, and in the majority of the fatal cases the nature of the injury is such that death must result regardless of the conditions of operation, and an exploratory laparotomy may add a fresh danger to the patient.

¹ British Medical Journal, October 4, 1902.

2. When occasions arise in which the conditions of operation approximate to those in civil practice laparotomy should be done in cases of increasing intraperitoneal hemorrhage endangering life, and when there is reason to believe that perforation of the stomach or bowel exists, provided the patient be seen early enough.

TREATMENT ON THE BATTLEFIELD. Hildebrandt, at the Thirty-first Congress of German Surgeons, April 2, 1902, read a paper on the subject of "Abdominal Injuries Resulting from Small-calibre Weapons and Their Treatment on the Battlefield,"¹ which, being based upon his own personal experience in the South African War, is of considerable interest.

He refers to the great difference of opinion as to the prognosis in these cases, most surgeons believing that more than half of all cases of perforative shot wounds of the abdomen that survive the battle recover, others again holding far less optimistic views. The explanation for this difference of opinion, he thinks, is to be looked for in the fact that the former class judge from the more favorable cases observed at the reserve hospitals and halting-places, while the latter derive their impression from the cases seen on the battlefield.

Watson Cheyne² states that in the beginning he believed that only 20 per cent. of the cases that did not prove immediately fatal died later. After the skirmish at Karree Siding, however, he changed his view. Of the 154 wounded on that occasion, 15 were perforative shot wounds of the abdomen; of these 5 died within twenty-four hours and 5 others later. At Paardeberg and Driefontin his experience was the same; out of 12 cases of abdominal shot wounds 8 died, the total result thus showing that only 33½ per cent. recovered.

Küttner, who reports 56 per cent. of cures, remarks, however, that little importance should be attached to this estimate, as it was not based on average material.

The same, Hildebrandt states, is true of the statistics of MacCormac, Treves, and others; in fact, he adds, we have no such extensive and reliable statistics from South Africa as we have concerning the Spanish-American War in Cuba and the Philippines. Here 116 cases of perforative shot wounds of the abdomen were treated with 81 (70 per cent.) deaths.³ The total mortality was 83.8 per cent., with a death rate of 46.3 per cent. of cases dying on the battlefield.

Under certain conditions the prognosis may be even less favorable than this; thus Cheatle⁴ reported 9 deaths in 10 cases of abdominal

¹ Archiv f. klin. Chir., 1902, vol. lxxvii., No. 4.

² British Medical Journal, May 12, 1900.

³ Report of the Surgeon-General of the United States Army, 1900, p. 323.

⁴ Lancet, August 3, 1901, p. 267.

shot wound, although, it must be mentioned, that 4 of these were wounds inflicted by small-calibre weapons from a short distance, which, as has been generally observed, are far more unfavorable than those from a distance. Thus, La Garde, who reported 29 deaths in 41 cases of perforative shot wounds of the abdomen, expressed his opinion that in the cases that recovered the projectiles must have either been sent from a great distance or their speed must have been greatly diminished by passage through another body.

All Englishmen wounded in the abdomen during the siege of Mafeking died, although here the facilities were very good, and, hence, the chances of recovery favorable.

Hildebrandt states that the great majority of the cases of abdominal shot wounds died of septic peritonitis following perforation of a hollow viscus. In cases of uncomplicated injury to the large abdominal glands—in so far as they do not result in immediate or almost immediate death—the prognosis is much better; in these cases recovery is the rule. The cases of injury to the large intestine, with exception of the transverse colon, were found most amenable to treatment; next came the stomach cases, and, lastly, those of the small intestine. If it is impossible to determine with any degree of certainty which of the organs has been injured the direction of the canal made by the bullet may be of some service in enabling one to render the prognosis. Hildebrandt believes the following statements may be accepted as fairly reliable:

1. The prognosis in sagittal shot wounds of the abdomen is more favorable than of those taking a transverse or oblique course.

2. In the former the prognosis improves with the distance of the canal made by the bullet from the median line and its approach to the lumbar region.

3. Wounds below the umbilicus are more dangerous than those above the same.

4. Transverse shots terminating between costal arch and crest of ilium give a bad prognosis.

As regards the therapy in cases of penetrating shot wound of the abdomen, Hildebrandt states that, since it is a fact that the later mortality of these cases is 70 per cent., and higher still when the injury refers to that region of the abdomen occupied by loops of intestine, since, furthermore, it has been shown that the proportion of the penetrating to the non-penetrating shot wounds has changed from 1:3.5 (1870-71) to 1.7:1 (Cuba and Philippines) it is clear that we cannot afford to look on idly. He believes, therefore, that laparotomy should be done in all instances where symptoms of intestinal perforation are present.

Incision should generally be made in the median line, since perforations are usually multiple, and thus a better survey of the field is

obtained. Most careful search of the entire abdominal contents is absolutely necessary and best accomplished by means of complete eversion.

Early operation is of particular importance also in perforation of the bladder, especially if this have occurred extraperitoneally.

Careful transportation is of utmost importance. Treves reports that all his cases of abdominal shot wounds that had to be carried with great difficulty over rugged ground ended fatally, while those that were carried on stretchers, even though over great distances, recovered.

If primary laparotomy be desisted from the treatment is very simple—rest, opium, and no nourishment per os during the first few days. Hildebrandt places special emphasis upon the latter point, his experience having been that the immediate ingestion of water or alcohol on the battlefield often contributed to an early death.

Although secondary laparotomy offers little hope of success, Hildebrandt does not believe it should be entirely discarded, particularly if the symptoms of peritonitis have set in late and the general condition of the patients is good.

Surgeon-Major V. Hippel¹ publishes a very interesting paper on "Laparotomy in Times of War," in which he reviews the opinions expressed by the various writers on this subject and carefully weighs the pros and cons of operation on the basis of the literature at hand. His conclusions briefly stated are as follows:

I. Laparotomy is a necessary and useful operation also in times of war. With proper organization it may well be carried out.

II. Laparotomy is indicated in cases of abdominal injury due to small-calibre arms.

1. Primarily—*i. e.*, within the first twelve hours.
 - a. In the presence of internal hemorrhages, provided the condition of the wounded permits.
 - b. In case of injury to the gall-bladder and gall-ducts.
 - c. In case of rupture of the bladder in consequence of simultaneous pelvic demolition.
 - d. With antero-posterior or transverse direction of the bullet in the region of the small intestine and transverse colon; also, in the absence of positive signs of intestinal injury.
 - e. With every other direction of the missile, so long as positive signs of injury to the small intestine are present.

¹ Archiv f. klin. Chir., 1902, vol. lxxviii., No. 3.

2. Secondarily—*i. e.*, after the first twelve hours.
 - a. In the presence of general peritonitis, if the patient's strength permits.
 - b. In cases of late or progressive peritonitis in which in the beginning symptoms of peritoneal infection were very slight or entirely absent.
 3. It is indicated as a means of exploration in cases where the bullet took a transverse direction between flank and umbilicus, if there is no place of exit of the bullet, if organic injury cannot be determined (relative indication).
- III. Abdominal injuries inflicted by artillery, in so far as they are perforative and leave any hope at all, should always be operated for.
- IV. The general station for the dressing of wounds is not a suitable place for the performance of laparotomies, not only on account of lack of time and the impracticability of observing strict asepsis, but mainly because it is generally impossible to operate in a closed room and because of the necessity of transportation after operation.
- V. Laparotomy should be done in the field hospital, whence the injured should be directly transported, and which should be properly equipped for such work.

Acute Appendicitis. Sprengel,¹ on the basis of his statistics comprising 516 cases of acute appendicitis operated upon since December, 1900, by himself and others (Rehn, Riedel, Schnitzler, Sonnenburg), attempts to answer the following questions:

- I. How does the risk of the interval operation compare with that of operation during the attack?
- II. Are there any special dangers connected with early operation as such, particularly as compared with interval operation?
- III. How do the results of early operation compare to those of late operation—*i. e.*,
 - a. In general.
 - b. After the various stages of the disease.
- IV. Are the results materially different when the processus is removed during the attack from what they are when it is left behind?

As regards I., we find that 232 cases were operated upon during the interval, with 2 deaths (0.86 per cent.), and 284 during the attack, with 57 deaths, or 20 per cent. This shows the mortality of the interval operation—taking all cases together without distinction—to be very slight as compared to that of the operations during the attack.

¹ Archiv f. klin. Chir., vol. lxxviii., No. 2.

With reference to points II. and III., Sprengel's table shows 47 cases of early operation (*i. e.*, done within the first two to twenty-four hours), with 8 deaths. In 9 of these, in which there was no peritonitis, the mortality was *nil*; in 22, with partial involvement of the peritoneum, there was 1 death; in the remaining 16, with free peritonitis, there were 7 deaths.

Outside of these, Sprengel reports 11 cases of early operation by Körte and 9 by Payr, all of which recovered. From Körte's cases, although all presenting exceptionally grave symptoms, those with free peritonitis were excluded.

These figures, although insufficient to permit of any definite statement, would seem to show the results of early operation in cases where the peritoneum is intact or at least but partially involved, to be equally as good as those of the interval operation. Sprengel does not believe that there is any special danger attached to early operation as such.

Sprengel's table further shows 237 cases operated upon later than two to twenty-four hours after onset of the attack, with 48 deaths; 11 of these, in which there was no peritonitis, recovered; of 184 with partial peritonitis, 19 died, and of 42 with free peritonitis, 30 succumbed.

The foregoing figures show the mortality of operation in the absence of peritonitis to be *nil* for early as well as late operations; for early operation with partial peritonitis, less than 5 per cent.; for late operation more than 10 per cent., and, lastly, a mortality of 43 per cent. for early operation in the presence of free peritonitis, 70 per cent. for late operations with free peritonitis.

Thus question III. will have to be answered in favor of early operation.

With regard to the advisability of making the removal of the appendix during the attack a routine measure, Sprengel states that in his mind there is no longer any doubt that in cases of operation within the first two to twenty-four hours in which the exudate, if present, is generally but small and the intestines are, as a rule, not very greatly distended, the appendix should be removed. When it comes to the later, more advanced stages of the disease, however, he thinks this question still has to be considered an open one.

RECURRENT APPENDICITIS. Joseph Koch,¹ of St. Hedwig's Hospital (Rotter), in an article entitled "Experiences with Chronic Recurrent Perityphlitis on the Basis of Two Hundred Radical Operations," refers to the different views held by some of the leading surgeons with

¹ Archiv f. klin. Chir., vol. lxxvii., No. 2.

regard to the indication for operation. He states that while in 1899 Rotter, Körte, and Kümmel advocated the so-called individualizing treatment of perityphlitis in 1901, at the last German Congress, Sprengel, Rehn, and Riese recommended early operation in every case of perityphlitis. Even the interval operation which had been considered as comparatively free from risk received a setback by Sprengel's statements. The latter holds that the interval operations after serious attacks of appendicitis represent the most serious type of abdominal operations. He reports a mortality of 10 per cent. in this class of cases.

Koch's report, comprising 200 radical operations, with a mortality of 0.5 per cent., includes all the cases of perityphlitis operated upon at St. Hedwig's Hospital since 1896.

Ninety-six of the cases were men, 104 women. The ages of the patients ranged as follows :

		Male.	Female.
1 to 10 years	. . . . .	1	4
10 to 30 "	. . . . .	63	70
30 to 50 "	. . . . .	29	26
50 to 60 "	. . . . .	3	4

Radical operation was performed after the first attack in 70 patients (36 men, 34 women); after the second attack in 44 (20 men and 24 women); after the third attack in 29 (14 men and 15 women); after the fourth attack in 13 (6 male, 7 female); after the fifth attack in 13 (7 men, 6 women); after the sixth and more numerous attacks in 19 (11 men and 8 women); in 10 cases the disease had remained chronic.

Fifty-eight patients had been operated upon before. In 9 of the 200 cases reported a fistula was found to have persisted since the opening of an abscess; three times it was a simple, three times a fecal, and three times a tuberculous fistula. The simple fistulæ were generally due to the processus vermiformis. All these fistulæ became permanently closed after operation.

In comparing these results with those of Sonnenburg, who observed simple fistula twenty-five times, fecal fistula fifty-one times, in a series of 444 cases, Koch states that the superior results achieved at St. Hedwig's Hospital are undoubtedly due to their method of operation, which is radically different from that of Sonnenburg. While with them it is a firm rule, in cases operated upon during the attack, to merely open the abscess, without attempting to remove the appendix, except this can be very easily done, Sonnenburg aims to resect the appendix during the attack whenever possible.

With regard to the question as to when the radical operation should be performed, Koch states that if the patient has passed the acute attack, with or without surgical intervention, and has remained abso-

lutely free from fever for four or five weeks, it is time for operation. At the end of this time the inflammation has subsided and a spontaneous cure has set in, relatively speaking. In the entire series it happened but six or eight times that a small abscess, containing fluid pus, was still present at the time of operation. This was examined bacteriologically in several instances, but was invariably found sterile.

Koch admits that the radical operation may be most difficult at times, but states that it is certainly less dangerous, as shown by the figures reported—only 1 death in 200 radical operations.

Koch claims that after an afebrile period of four to five weeks he operates aseptically; there is no danger of infecting the peritoneal cavity while searching for and removing the appendix.

With regard to wound healing, Koch states that 175 cases made an uninterrupted recovery; 110 cases were traced, and, with the exception of 15, carefully examined; 105 were free from hernia (in all of these the wound had healed by first intention). The remaining 5 cases, in whom tamponade had to be employed, or a fistula had prevented primary union, ventral hernia had developed. None of the patients has had a recurrent attack of perityphlitis after the radical operation.

Chronic Tuberculosis of the Intestine. Robson¹ reports several operations for chronic tuberculosis of the intestine with stricture. In three instances the family and personal history, the early age of the patient, loss of flesh and night-sweats suggested that the stricture was tuberculous rather than cancerous. In some of these cases the diseased bowel was resected, while in the others it was eliminated from the fecal stream by lateral anastomosis or by colotomy. The physiological rest thus obtained produced so beneficial an effect upon the diseased parts that Robson strongly recommends these simpler operations in cases in which excision is accompanied with a good deal of risk.

In three cases tuberculous peritonitis coexisted and had failed to be arrested by previous exploratory laparotomies. In two of these cases it disappeared, as far as clinical symptoms can prove that fact, after the removal of the chief focus of the disease, namely, the tuberculous appendix. In the third case tuberculous peritonitis was apparently cured by eliminating the disease by a lateral anastomosis.

These facts may explain why tuberculous peritonitis is sometimes cured by a simple laparotomy and sometimes progresses unfavorably even after the peritoneum has been exposed to light and air. In the latter cases it may well be thought there is some starting-point for the trouble in a tuberculous appendix or tube or ovary which keeps up the disease in the peritoneum. One should, therefore, remove any tuber-

¹ *Lancet*, 1902, vol. ii. p. 651.

culous masses found in the mesentery or retroperitoneal lymphatic glands, intestine, etc. According to Robson's experience, the outlook for patients suffering with chronic abdominal tuberculosis is by no means hopeless.

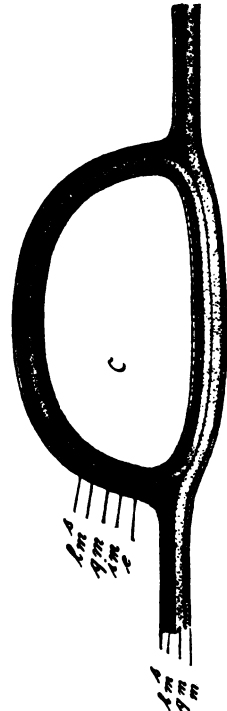
Intestinal Tumors. Gfeller¹ reports a case of *cyst* of the wall of the small intestine which caused its possessor many attacks of colic from the fifth to the eleventh year of her life, and then produced complete

FIG. 28.



Cyst of the small intestine.

FIG. 29.



Section of cyst and intestine.

intestinal obstruction by twisting the loop of bowel which contained it completely around. The abdomen was opened first on the right side and then in the median line, and the cyst (Fig. 28) was shelled out without resection of the intestine, as the vitality of the parts had not been interfered with by the volvulus. The cyst, which was situated between the longitudinal and circular muscular coats, was peculiar in that it was lined in great part by stratified epithelium, whereas most of such cysts have been wholly or mostly lined with cylindrical epithelium

¹ *Deutsche Zeitschrift f. Chirurgie*, 1902, vol. lxx. p. 330.

like the normal intestine. As shown in the diagram (Fig. 29) the cyst has its own muscular coat *im*, in addition to the longitudinal *lm*

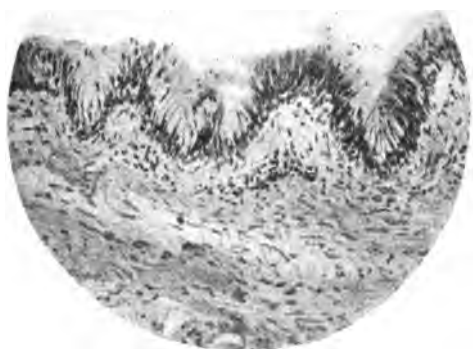
FIG. 30.



Stratified epithelium with which the greater part of the cyst was lined.

and circular *qm* muscular coats of the intestine. The child had an uneventful recovery after the operation.

FIG. 31.



Tall cylindrical epithelium which formed the lining of the cyst in places.

Niemack¹ reports three cases of multiple *polypoid tumors* of the large intestine occurring in a man, his nephew, and daughter. The child

¹ Annals of Surgery, 1902, vol. xxxvi. p. 104.

was operated upon and recovered, but later died from exhaustion, as the disease was very widespread in the whole colon and some of the ileum. In the man the trouble was confined to the lower portion of the rectum and was successfully removed. There were already evidences of carcinomatous degeneration. In the nephew the disease apparently involved the whole large intestine and no operation was performed.

Barker's¹ experience with primary resection of intestine and with the establishment of an artificial anus for the relief of malignant as well as mechanical obstructions of both large and small intestine, inclines him to the view that a free primary excision and suture will give the patient the best chance of recovery. In cases in which the extent of the malignant disease is too great for this, the surgeon should strive by making an anastomosis of the portions of bowel above and below the tumor to avoid an artificial anus.

Primary resection of gangrenous intestine is now generally recognized to be the operation of choice, since the removal of the gangrenous bowel saves the patient from the absorption of much poisonous material. Many of the failures following this plan of treatment have been due to the fact that not enough gut was resected to bring the sutures into healthy tissue. One of Barker's fatal cases was of this character. But it seems rather unlikely that surgeons are ready to advocate so generally the plan of primary resection of malignant intestinal tumors. Often the ileus which coexists makes the operation technically difficult while it has lowered the vitality of the patient. Mikulicz is still an advocate of extraperitoneal resection of malignant tumors of the large intestine. This operation, as previously performed by him, consisted in freeing the affected bowel to such an extent that it could be brought out of the abdomen together with all enlarged lymph glands, etc. The peritoneal cavity was then closed, and a day or more later the tumor was cut away. At a still later date the spur between the afferent and efferent portions of bowel was crushed and the external orifice closed. In his latest writing on this subject, Mikulicz has so far receded from his previous position as to cut away the tumor as soon as he has closed the abdomen, though he is as great a believer in his extraperitoneal method of resection as ever, and certainly his results justify him in this belief.

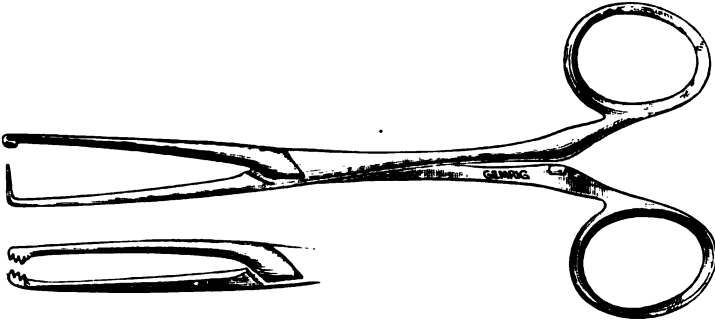
The occurrence of attacks of colic in a middle-aged person should always suggest the possibility of *cancer of the large intestine*. If in addition there are occasional attacks of a mild diarrhoea, or minute hemorrhages in the stools, the presumption is much stronger. Crämer²

¹ British Medical Journal, 1902, vol. i. p. 1525.

² Münchener med. Wochenschrift, June 17, 1902.

found that the symptoms of colic, meteorism, or even temporary occlusion may be produced by excessive use of tobacco. He mentions two valuable symptoms which are sometimes found in carcinoma. These are a stiffening of the bowel above the stenosed portion and a peculiar gurgle which he calls Schüttgeräusch. He compares it to the sound

FIG. 32.



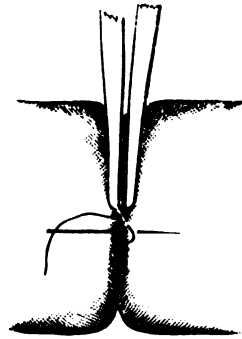
Tenaculum forceps. The spike on the end of one blade fits into a hook on the end of the other.

FIG. 33.



Method of using tenaculum forceps in intestinal suture.

FIG. 34.



Peritoneal surfaces held by rat-toothed forceps for the application of a Lembert suture.

made by pouring water from a pitcher upon the ground. He thinks that it is due to a return of the fluid in the intestine after it is thrown against the stenosis by the peristaltic motion of the intestine. Tenesmus is one of the earliest signs of carcinoma of the rectum. The rectum ought to be carefully examined in every case in which this symptom is present.

Intestinal Anastomosis. Allis¹ has devised two instruments to facilitate intestinal anastomosis by suture. They are tenaculum forceps

¹ Annals of Surgery, 1902, vol. xxxv. p. 352.

and rat-toothed forceps, with the teeth placed at the side. He uses the former instrument, instead of tension threads, to hold the intestinal ends in apposition in order to introduce a suture from within the intestine. Threads are so apt to get in the way and obscure the field of suture. Besides, these forceps can be shifted quickly from one place to another in the circle of gut to be united.

The rat-toothed forceps are useful in picking up and holding the peritoneal surfaces of intestine in the application of a Lembert suture.

CONNELL'S SUTURE SIMPLIFIED. Turck¹ has modified the Connell suture by the use of tenaculum forceps instead of tension threads, which so complicated the Connell suture in description and were likely to get in the way in actual practice.

Turck's second modification of the suture is the use of a straight needle having a large eye in its point. This is passed through the intestine, and into its eye are threaded both of the loose ends of the suture in order to tie the final knot within the lumen of the bowel.

While this method of suturing with a continuous through-and-through stitch gives beyond question accurate approximation of the bowel, its advantages seem hardly sufficient to secure its general adoption in preference to the simpler method of suture recommended by Mikulicz.²

As the success of a circular intestinal suture depends upon the exact approximation of the serous surfaces at the point where the mesentery joins the bowel, he sutures, first, the mesentery, inserting an intramesenteric stitch between the serous layers to approximate the cut edges of the mesentery and also the muscular coats of the intestine. He next inserts two perimesenteric sutures which approximate the serous surfaces of the mesentery in accordance with Lembert's principle. One of these stitches is placed on either side of the mesentery. The ends of the intramesenteric suture are cut short, while the ends of the perimesenteric sutures are left long. He next inserts a continuous suture from within the intestine, passing through all of its coats. This suture begins at the mesenteric attachment and extends through nearly half of the circumference of the bowel. It is then recommenced at the mesenteric attachment and extends as far in the other direction as possible. The gap which of necessity remains is closed by two or three interrupted sutures tied externally. The usual continuous serous suture completes the operation. The ends of this suture are fastened to the perimesenteric suture on either side.

¹ Journal of the American Medical Association, 1903, vol. xl. p. 637.

² Handb. der prakt. Chir., 1902, vol. iii., part i., p. 203.

THE RECTUM.

Sigmoidopexy for Prolapse of the Rectum. Jacoby¹ cured a patient of prolapse of the rectum by drawing up the sigmoid and stitching it to the parietal peritoneum and the muscular planes of the abdominal wall. The incision for this purpose was made in the left side of the abdomen. The suture material was kangaroo-tendon, and the suture was passed twice under one of the longitudinal bands of the sigmoid before it was tied in the abdominal wall, thus making a sort of figure-of-eight. This method of suture was thought to approximate more fully the serous surfaces of the bowel and parietes. The patient was kept on a liquid diet for a week. There was no return of the trouble at the time of report.

Anal Actinomycosis. Thevenot² says that operative measures in actinomycosis of the anal region should be limited to the slitting up of abscesses. Attempts to remove the diseased tissue simply stimulate the growth of the fungus. This is especially the case in deep involvements where the bad effects of scraping and curetting of sinuses are plainly to be noticed. He reports the results in fifteen cases. There were no cures which he considered permanent, although three patients were temporarily free from the effects of the disease, while seven died, and the others were more or less benefited. Death is due to the protracted suppuration, plus an intoxication due to the specific organism of the disease.

Carcinoma of the Rectum. Lieblein³ reviews the records of 98 patients who entered Wölfler's clinic between 1895 and 1900 for carcinoma of the rectum. Of this number 38 left without surgical treatment, either because their condition was inoperable or because they were unwilling to submit to operation. Colostomy was performed for stenosis upon 13 others, while the remaining 47 patients were treated by radical operation; 3 patients were twice operated upon (amputation following resection). There were 28 amputations, with 3 deaths (10 per cent. mortality), and 22 resections, with 6 deaths (27 per cent. mortality). All of the deaths from sepsis occurred before the period when gloves were used by Wölfler at operations. Of the 34 patients who survived operation and whose subsequent history is known, 18 subsequently died, 7 were alive with recurrences, and 9 were living at periods of one to five years without recurrence, only 4 of them having lived more than two years without recurrence. Wölfler gives laxatives for nearly a

¹ New Orleans Medical and Surgical Journal, September, 1902.

² *Revue de Chirurgie*, August, 1902.

³ *Beiträge z. klin. Chirurgie*, 1902, vol. xxxiii. p. 464.

week before operation, and begins the opium immediately after and in some cases a few hours before operation. Preliminary colostomy is seldom employed. The principles of treatment are thus summed up by Lieblein :

1. In all cases in which the position of the growth permits of choice, resection of the rectum is preferable to amputation of the rectum.

2. If resection is followed by suture of the cut ends of the rectum, continence of feces will in most cases be wholly or nearly preserved.

3. The return of continence is synchronous with the return of sensibility of the mucous membrane.

4. The rectum should be exposed in the simplest possible manner. Excision of the coccyx is permissible, but resection of the sacrum should be avoided. Wölfler's parasacral incision gives plenty of room.

5. By the use of Wölfler's gloves the risk of infection of the wound will be lessened and the mortality from sepsis reduced.

Abdominal Operations on the Rectum. Abbe¹ advocates the abdominal route for rectal tumors, except those which are situated in the anal portion or so near it as not to involve the bowel above the peritoneal reflection.

He has many times operated by Kraske's method, but finds it unsatisfactory because of the tendency to cut off the rectum only a short distance above the tumor ; because of the intimate adhesions often found between the rectum and the hollow of the sacrum ; because of the soiling of the wound when the bowel is opened, and because of the loss of blood supply resulting from ligation of hemorrhoidal vessels in order to make the rectum movable.

If the patient is placed in the Trendelenburg position and a liberal median abdominal incision is made the manipulation of the rectum is easy. Abbe passes two purse-string sutures around the bowel a considerable distance above the tumor, cuts it across between them, inverts the stumps, and cleanses them. Resection of the diseased portion of the rectum, together with involved lymphatics, is then easily and neatly performed with a minimum loss of blood. The patient is next placed in a lithotomy position and the operation concluded from below.

Abbe believes it better to utilize the upper end of the bowel for an inguinal colostomy than to put it on a severe stretch by bringing it into a perineal or sacral wound. His reasons are as follows :

1. In the combined method it settles at once all uncertainty and delay by having it brought out of the inguinal cut before the patient leaves the Trendelenburg position, thus leaving the operator free to confine his whole thought to most thorough enucleation of the cancerous rectum.

¹ *Annals of Surgery*, 1902, vol. xxxvi. p. 222.

2. It removes the anal discharges forever from the pelvis and thus takes away one source of renewed irritation of any remaining cells of disease.

3. If the base of the bladder proves to be involved in the complete operation and a possible leakage occurs the dangers of mixed urinary and fecal contamination are obviated.

4. The results of newly-established artificial ani in perineum or sacrum are such that continence of flatus and feces cannot usually be hoped for, even to as great an extent as in an inguinal colostomy; therefore, inasmuch as a T-bandage or napkin will usually have to be worn, the inguinal has no disadvantage.

5. When, then, the operator begins with the idea of turning the sigmoid colon up into the groin permanently he is much freer to dissect the highest part of the rectum and lower sigmoid with the hemorrhoidal vessels, and then clean out all the infected lymphatics from the pelvis, *ab initio*. The operation, as a whole, is thereby simplified and abbreviated as well as made more thorough.

6. The great majority of cases with return of disease ultimately require an artificial anus, and it should be anticipated in all by this preparation.

Intestinal and Rectal Cancer. In the *Interstate Medical Journal* for August, 1902, Hochenegg, of Vienna, gives a tabulated account of all of his cases of intestinal cancer, including those of the rectum, on which operation has been performed. Hochenegg's extensive experience, especially in the treatment of cancer of the rectum, makes these statistics of very great value.

He has operated in 282 cases, radical operation being performed in 194, or 67.7 per cent. of the cases, with 24 deaths, or a mortality of 12.3 per cent., and 170, or 87.6 per cent. recoveries. The number of permanent cures he estimates at 32 (16.2 per cent.).

In this series of cases the disease was located in the rectum 237 times, in the sigmoid flexure 28, splenic flexure 4, descending colon 1, transverse colon 1, ascending colon 2, and cæcum 9 times.

In 89 cases palliative operations, either enterostomy or anastomosis, were performed. Of the enterostomy cases—82 in number—2 were improved, 30 died. Of the anastomosis cases—7 in number—6 were improved, 1 died.

In the one case of cancer of the transverse colon resection was performed, and the patient was still well, without recurrence, eight years after operation. The method of operation in this case was somewhat novel, and inasmuch as Hochenegg used it successfully in 5 other cases—2 carcinoma of the splenic flexure and 3 of the sigmoid—it is worthy of brief mention.

The tumor was fixed in the abdominal wound by means of a strip of iodoform gauze pulled through an opening made in the mesentery. The abdominal wall was closed above and below the tumor as far as possible. Later in the same day an opening was made in the gut a short distance above the tumor and into this a glass tube was inserted, through which the bowel was slowly emptied without soiling the wound. After ten days the patient's condition was much improved and the bowels had been emptied sufficiently to warrant a second operation, which consisted of resection of the diseased portion of the bowel with end-to-end anastomosis and complete closure of the abdomen.

In regard to cancer of the rectum, it is well known that Hochenegg invariably operates by the sacral route. He states that he has reduced the mortality of the radical operation to 8.6 per cent.

Since 1887 he has operated upon 237 cases of rectal cancer, 174 of which were treated by radical operation with only 16 deaths, or a mortality of 9.19 per cent.

The fact that 174, or 72 per cent., of all his cases of rectal cancer were treated by radical operation would seem to show that he did not select his cases too carefully, although he personally does not believe in drawing conclusions from such figures.

Hochenegg gives the statistics of operations for rectal carcinoma at thirteen prominent German clinics. The mortality varies from 9.19 per cent. (his own) to 32.5 per cent. (König's). He states that in all his own operations he has not lost a single case through anæsthesia, hemorrhage during or after operation, shock, or collapse, nor from pneumonia following anæsthesia, and only two cases from acute sepsis resulting from the operation. These causes of death, he adds, sometimes furnish 50 per cent. of the fatal cases of other operators.

He lays great stress upon the preparation of the patient for operation, principally upon a thorough cleansing of the intestinal tract. He also considers careful after-treatment of the utmost importance.

Hochenegg's permanent results (17.3 per cent.) are second only to Kocher's (28.5 per cent.), although comparison is hardly fair, inasmuch as Kocher's series contains only 35 cases, while Hochenegg's comprises 174.

He states that of his own 174 cases radically operated upon the 8 in which the perineal route was employed and 112 of those operated upon by the sacral route have passed the three-year limit. Basing his statistics as regards permanent cures on these 120 cases only, with 35 living and free from recurrence—3 died of late recurrence—it appears that practically 25 per cent. passed the three-year limit. One patient remained well for more than fifteen years; 1, more than eleven; 2,

more than ten ; 3, more than nine ; 4, more than six ; 5, more than five ; 4, more than four years, and the remaining cases more than three years.

THE LIVER AND BILIARY PASSAGES.

Traumatisms. Finkelstein¹ says that the diagnosis of rupture of the liver can usually be made from the history of injury in the right hypochondriac region, from the shock, and from the symptoms of internal hemorrhage. In well-marked cases there will be tenderness over the liver with pain extending upward to the right scapula, and contracted abdominal muscles which react on the slightest touch. These are the early symptoms ; later there may be jaundice or symptoms of peritonitis. Often the symptoms due to rupture of the liver are so obscured by those of injuries of other organs that this accident has been wholly overlooked even at laparotomy. The treatment is chiefly an operative one, and operation ought not to be delayed on account of shock. This is usually due to internal hemorrhage, and delay means the loss of more blood, while stimulation of the circulation by saline infusion or otherwise while the bloodvessels are still open is very unwise. The recoveries which have followed delayed operations have been due less to the operation than to the fortunate spontaneous cessation of the hemorrhage. The prognosis is always grave. It may not be possible to find the source of the hemorrhage when the abdomen is open. When found no time should be wasted in closing the rent by suture, but the wound should be tamponed unless it is easily accessible. In 36 cases of rupture of the liver treated by operation, for the most part by German surgeons, recovery followed twenty-one times.

Eisendrath² mentions 22 recoveries and 15 deaths following operation for rupture of the liver. Many of the cases in the two collections are identical.

Grekow³ advocates suture for bleeding stab wounds of the liver, provided the wound is situated in the left lobe or so low down in the right lobe as to be accessible below the costal margin. If the wound is so situated that it cannot be brought into plain sight, or if it is deep and large vessels have been injured, it is better to control hemorrhage quickly by means of a tampon. Such a tampon should be removed a little at a time so as to avoid the risk of secondary hemorrhage and infection which may follow if it is wholly withdrawn and another introduced.

¹ Deutsche Zeitschrift f. Chirurgie, 1902, vol. lxiii. p. 408.

² Journal of the American Medical Association, 1902, vol. xxxix. p. 1095.

³ Deutsche Zeitschrift f. Chirurgie, 1902, vol. lxiii. p. 402.

HEPATIC HEMORRHAGE CONTROLLED BY SUTURE. Martinelli¹ considers suturing the best method of stopping hemorrhage from wounds of the liver. The tissue of the liver is friable, but if the sutures are inserted some distance from the edges of the wound and are not tied too tightly they will usually hold well enough to control hemorrhage. In gunshot wounds and very extensive wounds gauze packing is a better method for the quick control of hemorrhage. The writer mentions three methods of exposing the liver. The first is that of Micheli. Two incisions are made from the lower border of the fifth rib converging downward to meet at a point two inches below the costal margins. From there a single incision is continued downward as far as necessary. One of these incisions starts in the parasternal line, the other in the anterior axillary line. The underlying ribs are resected and the peritoneum, pleura, and diaphragm are incised. Guidone's incision starts from the upper border of the seventh cartilage and is carried downward to the costal margin, and from this point a transverse incision is made upward through the tenth intercostal space. This incision respects the pleura and diaphragm. Martinelli's method consists of a vertical incision commencing a finger's breadth to the right of the ensiform cartilage and extending downward. A second incision commences at the upper end of the first and follows the costal margin. The triangular musculocutaneous flap is drawn downward and outward while the ribs are elevated upward. In this manner a good view is obtained of the left lobe of the liver and a part of the anterior and superior surface of the right lobe.

Cholelithiasis and Hepatic Drainage. Although Kehr was not the first who intentionally drained the hepatic duct after opening the common duct for the removal of a calculus, he has insisted so strongly on the necessity of this procedure that his name is closely associated with it. Berger,² who for some time assisted him in his operations, gives the views which Kehr at present holds in regard to this operation after performing it nearly a hundred times:

1. Incision of the common duct should be followed by drainage of the hepatic duct rather than by suture, because by this means the coexisting cholangitis will be overcome, because calculi may escape or be extracted through the fistula, and because the operation takes less time.

2. Drainage of the hepatic duct is, therefore, very important if cholangitis coexists, or if all calculi in the common and hepatic ducts cannot be removed.

¹ *La Riforma Medica*, March 24, 25, and 26, 1902.

² *Archiv f. klin. Chirurgie*, 1903, vol. lxi. p. 299.

3. Even if the bile is clear and if no calculi are thought to be left behind, still hepatic drainage is the best method.

4. Experience has shown that hepatic drainage gives the best and most permanent cures, and it should be performed in every case of cholelithiasis, provided that it will not unduly prolong the operation.

5. It is contraindicated, as is every other operation in acute obstruction of the common duct, and also in acute suppurative cholecystitis, on account of the risk of spreading the inflammation to the hepatic bile-ducts. It is better, too, not to insist on hepatic drainage if the indications for its use are not urgent, and the patient takes the anæsthetic badly, or does not stand the necessary abdominal manipulation very well.

6. Hepatic drainage may be easy or difficult, according to circumstances. It is best carried out through the supraduodenal portion of the common duct. Impacted calculi may have to be removed through special incisions into the hepatic duct or into the papilla. The drainage should be kept up until the bile is clear, and it is evident that the inflammation has subsided, and that there are no more calculi in the common or hepatic duct.

7. The results of hepatic drainage are excellent. It limits the extension of cholangitis and conduces to its disappearance. It also leads to the removal of additional calculi in about 17 per cent. of the patients thus treated, thereby preventing a recurrence of the trouble which would have followed suture of the common duct.

8. The good effects of hepatic drainage have still their limits. If there is diffuse cholangitis it is powerless to effect a cure, and equally so if there are many calculi situated high up in the branches of the hepatic duct. But recurrence of attacks rarely follows hepatic drainage.

9. Hepatic drainage in uncomplicated cases is not a dangerous operation, with a mortality (from pneumonia, vomiting of blood, or acute dilatation of the stomach) of only 2 or 3 per cent.

10. The risk of the operation is increased by the existence of such complications as cholangitis of the larger branches of the hepatic duct, long-continued jaundice and cholæmia, cirrhosis of the liver, disease of the pancreas, fistulæ between the biliary and intestinal tracts, or extensive adhesions.

11. The mortality of this operation is almost 100 per cent. when it is performed in the presence of diffuse cholangitis, suppurative hepatitis (abscess of the liver), carcinoma of the biliary tract or of the pancreas. In such cases the mortality is rather due to the long delay in performing the operation or to the nature of the disease.

12. The best way to avoid this high mortality is to operate early. If obstruction of the common duct is not wholly overcome by three

months of internal treatment (Carlsbad cure), then an operation should be performed.

The technique of hepatic drainage as performed by Kehr has been several times published, but is worth repeating. The bowels of the patient are thoroughly emptied by castor oil and fluid diet for two days before operation and calcium chloride is given by mouth (gr. xxx) and rectum (5j) two or three times a day for several days to limit the amount of hemorrhage. The preparation of the hands of the operator, assistant, and nurse (only three persons take part in the operation) occupies from forty-five to sixty minutes or longer than the operation itself. Kehr uses what he calls a wave-cut, a combination of vertical and oblique incisions, which, beginning at the ensiform cartilage, extends downward in the median line for 4 or 5 cm. (2 inches), then crosses two-thirds of the rectus muscle parallel to and 3 to 4 cm. (1.5 inches) below the costal margin, and then again becomes vertical, and extends downward as far as the level of the umbilicus. This incision gives a good view of the pylorus as well as of the biliary passages, and is rarely followed by hernia, in spite of free tamponing of the wound. Silk is the only material used for ligature. The assistant presses the stomach and duodenum downward and the liver upward. If adhesions are present they are divided step by step under the guidance of the eye, and if in spite of caution an opening is made into the stomach or duodenum it is at once sutured and covered with omentum if possible, while an opening into the gall-bladder is temporarily clamped. The common duct is approached from the gall-bladder, and after the passages are exposed the surgeon decides what to do with the gall-bladder. The best treatment is to remove it, particularly if its wall is inflamed, or connected by the alimentary canal by fistulae, or if the cystic duct is obstructed. The calculus in the common duct is cut down upon if possible in the supraduodenal portion, and after all calculi have been removed a soft-rubber tube of larger or smaller calibre, according to the size of the hepatic duct, is passed through the wound in the common duct upward into the hepatic duct. Sometimes the bifurcation of the hepatic duct is so low down that the tube can be introduced for only a short distance. It is well to nick the tube slightly, though not, of course, opening its lumen, at a little distance from its end so as to know how far it is inserted into the ducts. The tube is fastened into the common duct with a silk stitch, and the wound in the latter if unnecessarily large is partly closed with silk stitches, which are left long so that they can later be extracted.

Sometimes an additional tube is placed in the common duct. The tube (or tubes) is surrounded completely by long strips of gauze. The first of these strips reaches into the foramen of Winslow; the second

lies in the bleeding hollow of the liver from which the gall-bladder was torn out; the third lies above the incision in the common duct and upon the hepatoduodenal ligament; the fourth covers the ligature of the cystic arteries, the cystic duct, and the sutures in the common duct, and the fifth lies between the drainage tube and the stomach and duodenum.

In simple cases the operation takes from thirty to forty minutes; in complicated ones it may require two hours or longer. Great weight is laid on the after-treatment of the patients by rectal injections of saline solution, gastric lavage, etc., to overcome vomiting and intestinal stasis. The gauze and tube are not disturbed for two weeks, and before that time the bile will be flowing freely into the intestine by the side of the tube. The stitches and ligatures loosen a little later and are removed easily. By means of the tamponade a deep funnel is formed, wholly shut off from the peritoneal cavity, in the bottom of which lies the hepatoduodenal ligament with the common duct.

Robson,¹ who has performed choledochotomy for impacted calculus sixty-eight times, reports a mortality of about 15 per cent. for the whole series. The mortality of the last twenty-one cases is only 5.5 per cent.—an improvement which the author attributes to improved technique, the facility which comes from experience in performing a certain operation, and to the avoidance of shock and hemorrhage at and after operation. Robson usually sutures the common duct, and only in special cases drains through the wound in it, or through the gall-bladder.

Cholecystostomy or Cholecystectomy? Blake² agrees with Kehr that cholecystectomy is preferable to cholecystostomy unless drainage is indicated. Cholecystectomy is the operation of choice in (1) gangrene of the gall-bladder and suppurative inflammations endangering its vitality; (2) neoplasms of the gall-bladder; (3) injuries of the gall-bladder, and (4) permanent obstruction of the cystic duct. It is indicated, though not so imperatively, in contracted gall-bladder which cannot be attached to the parietal peritoneum for drainage, and calculi impacted in the cystic duct, which cannot be removed except by incising the duct.

Cholecystectomy should not be performed under circumstances in which drainage is indicated. For example, if there is uncertainty as to the patency of the common duct; if suppurative cholecystitis exists without sloughing; if there is cholangitis or if the duct is sutured after choledochotomy, and the gall-bladder can be easily and safely drained. The removal of the gall-bladder should not be attempted if the pron-

¹ *Lancet*, April 12, 1902.

² *Medical News*, 1902, p. 883.

gation of the operation will lessen the chances of a feeble patient for recovery.

The advantages of cholecystectomy as compared with cholecystostomy are: 1. A radical cure of the cholecystitis and gallstones by the removal of the nidus of infection and calculi. (Kehr reports recurrence of pain in 6 per cent. of cases treated by cholecystostomy.) 2.

FIG. 35.

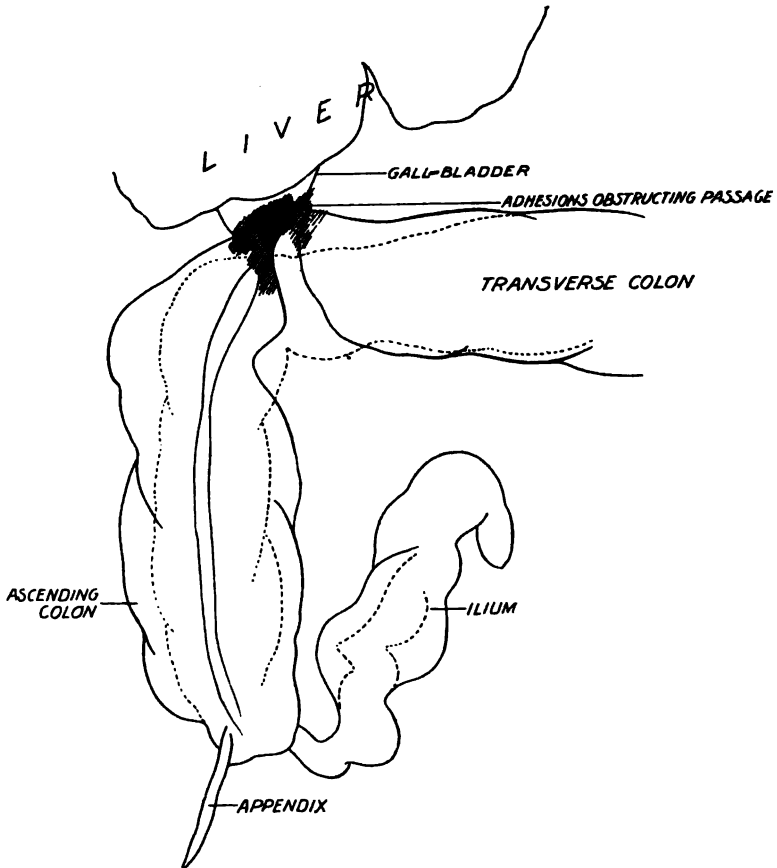


Diagram showing adhesions between gall-bladder and colon, almost completely obstructing the latter.

Avoidance of biliary fistula. 3. A perfectly clean operation with no soiling by infected bile. 4. Avoidance of adhesions. As an objection to cholecystectomy, its greater mortality, as shown by statistics, at once presents itself. In considering this the fact must be taken into account that cholecystectomy has been chiefly performed for serious conditions, such as gangrene, malignant disease, and contracted gall-bladders buried

in adhesions. Cholecystectomy in favorable cases is an easy and rapid operation, and a safer operation than cholecystostomy with its attendant dangers of infection.

Niles,¹ in a paper upon some late results following inflammation of the gall-bladder, cites two very interesting cases in which much relief was obtained by operation. The first was a case of chronic colitis produced by a partial occlusion of the colon at its hepatic flexure by old adhesions between the gall-bladder and colon. This patient, a man aged fifty-nine years, had suffered for twenty-four years with occasional irregular attacks of pain and distention of the stomach and bowels

FIG. 36.

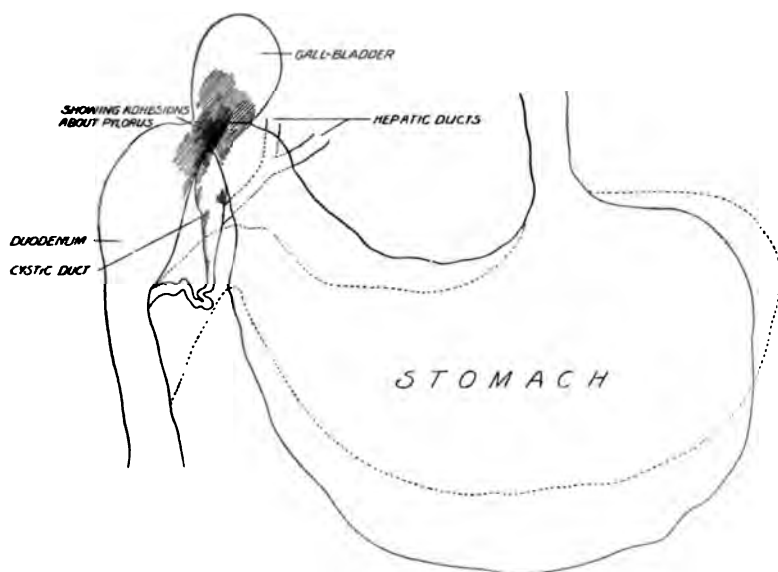


Diagram to show the effects of adhesions between the liver, gall-bladder, and pylorus. The pylorus is drawn out of place and stenosed, and the stomach is dilated to about four times its normal capacity.

which incapacitated him for a few days at a time. By careful examination of one organ after another the disease was narrowed down to the gall-bladder and colon, and at operation the condition found was that outlined in Fig. 35. The adhesions were broken and the gall-bladder was opened and drained, after about sixty small stones had been removed from it.

In the other case the adhesions had formed about the pylorus, giving the usual symptoms of chronic pyloric stenosis, and as the patient often vomited blood in the shape of coffee-grounds the diagnosis of cancer of

¹ *Annals of Surgery*, 1902, vol. xxxv. p. 345.

the pylorus would have been made had not the results of the gastric contents disproved such a theory. The conditions found at operation are shown in Fig. 36. This patient was much benefited by separation of the adhesions, though he still suffered at time of report from the gastric dilatation.

Technique of Operations for Gallstones. Manton¹ removed a dilated gall-bladder with gallstones in the cystic duct through a lumbar incision. The operator did not choose this incision intentionally, but because he had made a diagnosis of movable kidney with probable cystic degeneration. When exposed the kidney was found to be healthy. It was brought out upon the back, and as the distended gall-bladder was easily reached through the wound it was decided to remove it. The patient made a good recovery. Manton believes that the lumbar route will offer certain advantages over the customary anterior incisions in cases in which a diseased condition of the kidney is associated with disease of the biliary tract.

Morison² advocates a long transverse incision in operations upon the biliary passages. He secures free access to the gall-bladder and its ducts, with a minimum disturbance of the abdominal viscera, free drainage, and a slighter chance of hernia than when a vertical incision is employed.

The skin incision, when a difficult common duct operation has to be done, begins one inch below the tip of the twelfth rib and ends in front of the median line, one-third of the distance from the ensiform cartilage to the umbilicus. All the layers of the abdominal wall, including the rectus muscle, are divided and the cut edges of the peritoneum are caught in clip forceps. (Fig. 37.) A thick gauze pad or sponge is then packed into the abdomen under the lower flap of the wound and over the colon and omentum, shutting off access to the general peritoneal cavity in this direction. On the inner side and in front the stomach is covered and protected by a gauze pad. The wound may be more thoroughly opened out by making the ileocostal space convex to the right and pushing the hips and shoulders to the left. (Fig. 38.)

Drainage of the common duct is effected by leaving the incision in the duct unsutured with a large tube opposed to it, but not inserted into the duct. Drainage of the gall-bladder is secured in a similar manner, although in this case the tube may be stitched to the gall-bladder. Additional gauze drains should be employed to prevent the tube from kinking. The wound is closed in four layers. A catgut suture brings together the peritoneum, fascia, and transverse and

¹ American Medicine, October 4, 1902, p. 538.

² British Medical Journal, 1902, vol. ii. p. 1487.

internal oblique muscles. A second catgut suture approximates the external oblique muscle, a third the fat, while a fourth suture, either catgut or silkworm, is introduced as a subcuticular one to hold the skin together.

Robson's¹ incision for exposing the gall-bladder and common duct has been employed by Pollard in five cases. The use of a large sand-bag posteriorly pushes the liver forward so that its lower portion can be everted over the costal margin. This exposes both the cystic duct and common duct, and lifts them forward so that they form a straight curve from the fundus of the gall-bladder to the duodenum. Incisions

FIG. 37.

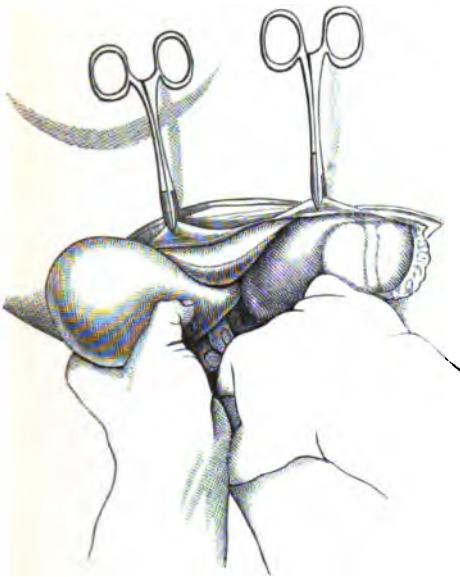
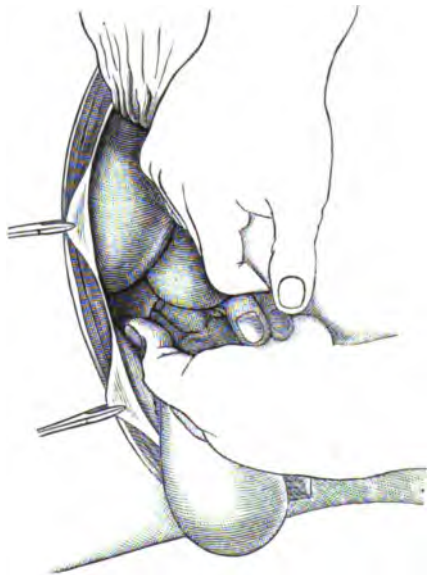


FIG. 38.



in either of these ducts are easily stitched with a curved intestinal needle held between the thumb and forefinger. When the sandbag is removed these parts sink backward so that if a gauze drain is already in position it will prove too short. Therefore, the sandbag should be removed before the drain is inserted.

Fixation of Movable Liver. Carstens² finds that ninety-eight cases of floating or movable liver have been reported in literature in such a way that some conclusions can be drawn as to the etiology, symptoms, and treatment of this class of cases. He finds the cause of movable liver to be either an injury, a fall, heavy lifting, or, in a few

¹ *Lancet*, 1902, vol. ii. p. 1316.

² *Journal of the American Medical Association*, 1902, p. 1295.

cases, the development of malignant growth. The symptoms of floating liver are distress and feeling of weight in the region of the liver, often combined with tympanitis and intestinal dyspepsia. There are, besides, nervous symptoms of various sorts. Many of the patients have been greatly relieved by wearing a bandage. Only a few operations have been reported, most of them being nothing more than an exploratory laparotomy. There have, however, been some permanent cures. Carstens reports such an operation in which the liver hung down as far as the brim of the pelvis, but was easily replaced in its normal position. The upper surface of the liver and the opposing parietal peritoneum were scraped so as to facilitate the formation of adhesions, and the round ligament was stitched in the upper angle of the wound. Two successful cases of suspension of the liver were referred to last year.¹ In these cases Jonas sutured the gall-bladder in the uppermost portion of the abdominal wound, and succeeded by this means in keeping the organ in its normal position.

Operations for Ascites. Harris² reports a number of cases of *cirrhosis of the liver* in which Talma's operation or some modification of it was performed for ascites. His list includes many cases which have been previously published. There are twenty-three cases of alcoholic cirrhosis with atrophy. Thirty per cent. of these patients died within fourteen days of operation; 52 per cent. within two months after operation, while 56 per cent. were dead within six months of operation. Ascites returned in all of the fatal cases in which death was delayed for a few weeks; 13 per cent. of the patients recovered from operation and were free from ascites at the end of a year or more. In the remaining 33 per cent. of the cases there was either no improvement, the ascites having returned, or the period since operation was too short for a fair test. The pathology of the remaining cases is varied, and the number is too small to permit a satisfactory grouping. There were cases of syphilitic cirrhosis, sarcoma of the omentum, malarial cirrhosis, enlargement of the liver, thrombosis of the portal vein, and tuberculous peritonitis; 25 per cent. of these patients were dead in four months; 40 per cent. were not improved by the operation; 15 per cent. were free from ascites for a year or more after operation, while in the remainder of the cases the outcome of operation was still in doubt.

Various operations have been performed: the omentum has been stitched to the parietal peritoneum; the parietal peritoneum has been scarified and scraped; the surfaces of the liver, spleen, and diaphragm have been scraped to increase the formation of adhesions, and the

¹ See *PROGRESSIVE MEDICINE*, June, 1902.

² *Journal of the American Medical Association*, May 3, 1902, p. 1137.

omentum has been placed in pockets between the peritoneum and muscles or subcutaneously. The number of cases is too small to permit of comparison of the different methods. Still, it appears that anastomosis more quickly forms when the endothelium of the peritoneum is removed by scarifying or scraping it with instruments. Any sort of drainage seems inadvisable. It is not only very annoying to the patient, but exposes him to the risk of infection, and does not seem to increase his chance of relief from ascites.

Talma's operation is based on the theory that the ascites is due to increased tension in the portal system and is, therefore, a pure pressure presentation. Harris doubts the correctness of this theory for the following reasons: 1. Atrophic cirrhosis may proceed to a fatal termination without the appearance of ascites. 2. Increased tension may exist in the portal system, as made manifest by gastric and intestinal hemorrhages, without the development of ascites. 3. In many cases of cirrhosis oedema of the feet and legs may precede the appearance of ascites by several weeks or even months, and in the absence of any apparent kidney disease. 4. In these cases of cirrhosis there is a characteristic inflammation of the peritoneum which must contribute to the development of an ascites by increasing the amount of fluid present and decreasing the rate of absorption. This chronic peritonitis has been practically overlooked. It is most marked upon the liver, where the peritoneum may measure 3 or 4 mm. (0.1 or 0.2 inch) in thickness. It is also found in the parietal peritoneum and that covering the mesentery and the small intestine, the diaphragm, etc.

Talma's operation in itself is simple and practically devoid of danger, the deaths following it having been due to complications or to the advanced stage of the disease. Operation if performed at all should be performed early, before the changes in the portal system have taken place, for once the chronic peritonitis is well developed the operation is not likely to have any effect.

Müller¹ reports a case of ascites which might have been included in those to be treated by the establishment of portal circulation; but on account of the unsatisfactory results of Talma's operation he resolved to free the portal vein from the compression which seemed to be the cause of the ascites. The inflammatory adhesions and thickenings which surrounded the portal vein as well as the pylorus, the common duct, and the hepatic vessels were torn through or divided. The trouble seemed the result of a gastric ulcer, and the patient had once vomited blood six years before. At any rate, the ascites did not recur, and the patient was restored to full health by the operation.

¹ *Archiv f. klin. Chirurgie*, vol. lxxvi. p. 652.

THE PANCREAS.

Diagnosis of Acute Pancreatitis. From observation of eight cases of acute pancreatitis in which the diagnosis was confirmed either by observation or autopsy, Munro¹ gives certain symptoms which will aid one in making an early diagnosis. Sometimes the disease progresses so rapidly that the necessity of early diagnosis is apparent. For practical purposes he divides acute cases into mild and severe, although he admits it is not always possible to predict what the course of an acute case will be any more than it is possible to predict the outcome of an acute attack of appendicitis. Many of the mild cases recover spontaneously, and operation probably has no effect upon the course of these. In fulminating cases which go on rapidly to hemorrhage or abscess, operation and drainage offer the only hope of cure. Most patients give a history of preceding attacks similar to the one from which they are suffering, though perhaps less severe. There is always vomiting with severe abdominal pain, either coming on suddenly or after a period of milder pain. A chill is not invariable. Almost all patients are markedly fat. There is a certain amount of abdominal distention with some muscular spasm. There is invariably tenderness in the upper part of the abdomen, but in only three instances could a tumor be felt. The patients looked ill, though not necessarily peritonitic. The pulse ranged from 100 to 140, and the temperature from 99° to 104°. Sugar was present in the urine in only one case. The leucocyte counts were not of value. There was only slight or fleeting jaundice. So far as could be ascertained no gallstones were present in seven of the nine patients. Obstipation was not marked, and the bowels moved under the stimulation of a mild cathartic enema. Eight of these nine patients were operated upon and four recovered, two of them in spite of extensive necrosis.

Pancreatitis following Calculus. Nash² reports a case of acute pancreatitis which he thinks was due to calculus in the gall-bladder. The stone weighed 275 grains. The gall-bladder was opened and drained. It contained mucus stained with blood and bile, and the mucous membrane was much injected. There was no evidence of obstruction of the common duct, and Nash thinks that a catarrhal inflammation starting in the gall-bladder spread to the pancreatic duct and produced an infective pancreatitis. There was in this case considerable fat-necrosis and also glycosuria. As the patient recovered the quantity of sugar in the urine grew less, and six months after operation the urine was entirely free from sugar, and the patient, a man, aged sixty years, had practically recovered his health.

¹ *Journal of the American Medical Association*, 1902, vol. xxxix. p. 809.

² *Lancet*, 1902, vol. ii. p. 1192.

Disappearance of Chronic Pancreatitis. Owen¹ reports two cases of enlargement of the whole pancreas associated with epigastric pain, dyspepsia, ascites, and distinct tumor to the right of the umbilicus. Exploratory laparotomy was performed in both cases, but as the condition was considered malignant or inoperable nothing further was done. Both patients recovered from operation, and the symptoms, including the tumor, wholly disappeared in one case, and the other patient was much improved, though probably not permanently so. Similar cases were reported by Griffiths, who drained the gall-bladder; by Dalziel, who cut down upon a calculus in the pancreatic duct as large as a pea and removed it through the duodenum, and Myles, who removed seventy-two calculi from the gall-bladder. These were supposed to be the cause of a chronic pancreatitis and the gall-bladder was not drained. All three of these patients recovered. Dalziel reports a case of pancreatitis associated with jaundice due apparently to some obstruction in the common duct. No stone was found, and the cure was attributed to the manipulation of the parts.

Anatomical Relations of Pancreatic and Common Ducts. Some of the relations between biliary and pancreatic affections are made clear by the results of Büniger's² examination of the pancreas in fifty-eight cadavers. In about 95 per cent. of the cases the common bile-duct passed directly through the head of the pancreas and could not be separated from the latter except by cutting. In all cases but one the common bile-duct and pancreatic duct terminated separately in the duodenum, at a distance averaging 0.2 cm. ($\frac{1}{12}$ of an inch) apart. This shows why affections of the head of the pancreas are so often complicated by biliary obstruction, although obstruction in either the biliary or pancreatic duct is not likely to produce obstruction in the other. A lesion in the ampulla is, however, apt to obstruct both ducts and give symptoms of biliary and pancreatic retention.

Pancreatic Calculus. The diagnosis of pancreatic calculus has rarely if ever been made, and some writers have claimed that it is an impossible diagnosis to make, yet Moynihan³ made a correct diagnosis and succeeded in removing such a stone by operation. It was half an inch long and lay in the termination of the pancreatic duct. It was removed through the duodenum. The patient made a good recovery. The symptoms which suggested the diagnosis of pancreatic calculus were, briefly, steady loss of health, gradual wasting, irregular pigmentation of the skin in patches of the color of *café-au-lait* (very closely

¹ British Medical Journal, 1902, vol. ii. p. 1310.

² Münchener med. Wochenschrift, October 14, 1902.

³ Lancet, 1902, vol. ii. p. 355.

resembling the pigmentation of *molluscum fibrosum*), persisting attacks of epigastric pain, and uneasiness of the type of hepatic colic, though less severe and unattended until very late in the history by jaundice, which was then always trifling, though unmistakable, and pain passing through from the front of the abdomen to the middle of the back. There was no rigor or any complaint of sensations of heat or cold. The stools were occasionally "frothy" and "greasy." On examination under chloroform some indefinite swelling could be felt above the umbilicus, and a little to both sides of the median line, though chiefly to the right.

Pancreatic Cyst. Murray¹ incised and drained a pancreatic cyst, and the resulting fistula was still open three years after operation, discharging normally a small amount of fluid which was greatly increased if the patient became excited. Sometimes, however, as much as 100 c.c. (3ij) of fluid was discharged from the fistula within an hour.

Numerous chemical examinations of the fluid showed that originally it contained pancreatic products, but afterward took on the character of the contents of a serous sac. A perfect recovery and continued good health of the patient showed at least that sufficient normal pancreas remained to perform all of the functions of the gland. This is interesting as confirming Körte's view that incision and drainage of the true pancreatic cyst may be followed by a rapid and permanent recovery, even though a fistula remains which discharges a transudate containing a little solid matter, a great deal of water, and little or no pancreatic enzyme. There is no case recorded in which such a quantity of fluid was discharged for so long a time.

THE SPLEEN.

Removal of the Spleen for Traumatism. Beaumont and Houseman² report a case of traumatic rupture of the spleen in which the organ was torn in two. Operation was performed on the day following the injury. The pedicle was ligated and the whole spleen removed. In spite of the very great hemorrhage which had taken place within the abdomen the patient recovered, but his pulse remained permanently from 112 to 120, and there developed a general enlargement of the lymphatic glands with anæmia. Otherwise, four months after the accident, he was in apparently perfect health.

Ballock³ reports an operation for ruptured spleen performed nine days after the injury. About twenty ounces of old fluid blood and two double handfuls of clots were taken out of the peritoneal cavity. The patient died on the sixth day of gangrenous peritonitis.

¹ American Medicine, July 26, 1902, p. 133.

² Lancet, 1902, vol. ii. p. 744.

³ Annals of Surgery, 1902, vol. xxxvi. p. 44.

Shield¹ cut down upon a ruptured spleen three hours after the patient was kicked and crushed by a horse. The incision used was external to the left semilunar line. The peritoneal cavity was full of blood. The spleen was ruptured across the hilum; its pedicle was ligated and the organ removed. The patient was transfused with two pints of saline solution. Ten days after operation the leucocyte count was 21,000. Eight weeks after operation it had fallen to 16,300, and the number of red corpuscles was 4,962,500. The hæmoglobin equalled 82.5 per cent. The polymorphonuclear cells were 74 per cent.; eosinophile, 1.3 per cent.; hyaline, 8 per cent.; lymphocytes, 15.3 per cent., and transitional, 1.3 per cent.

When the patient was last seen the wound was completely healed, and he could walk about quite comfortably. There was no obvious enlargement of the glands or marked tenderness in the bones. At the time of report the patient was putting on weight and feeling strong.

Accidental Removal of Typhoid Spleen. Ashby² operated upon a young woman for a pelvic tumor with fever. To his surprise he found a greatly enlarged spleen. On account of its size and the length and weakness of its ligaments fixation was out of the question. Its pedicle was ligated, the stump covered with peritoneum, and the spleen removed. The patient, it seems, was suffering from typhoid fever, which was the cause of the rise in temperature, but this was not discovered until after the operation. The fever ran its usual course and terminated in recovery. There was no complication due to the removal of the spleen.

Mortality after Splenectomy. Schwarz³ reports ten cases of splenectomy, with eight complete recoveries. The ninth patient lived two months and died of exhaustion. This patient was in a cachectic state at the time of operation. The tenth patient died of peritonitis following operation. In six of these patients there was such torsion of the pedicle as to make operation imperative. The extirpated spleens weighed from 800 to 3500 grammes (27 to 117 ounces) each. Removal of the spleen is advocated in all cases of malaria with marked splenic enlargement. Only one of the patients was troubled with subsequent malarial attacks.

THE KIDNEY.

Surgical Treatment of Chronic Nephritis. Edebohls⁴ advocates renal decapsulation as a cure of chronic Bright's disease. Both kid-

¹ *Lancet*, 1902, vol. ii. p. 1125.

² *American Gynecologist*, August, 1902.

³ *Gazette d. Ospedali*, Milan, September 7, 1902.

⁴ *British Medical Journal*, 1902, vol. ii. p. 1507, and *Medical Record*, March 28, 1903, vol. lxiii., No. 3.

neys, he says, should be operated upon at one sitting, since the chief danger lies in the anæsthetic rather than the operation itself, and the patient should not therefore be twice anæsthetized. When possible the kidney is separated from its fatty capsule and delivered into or through the wound. The fibrous capsule is divided on a director along the entire convex border. Each half of the capsule is then stripped from the kidney and reflected toward its hilum. This can best be done with the index finger, so as to avoid tearing out portions of parenchymatous tissue. The capsule is next cut away and removed. The kidney is replaced in its normal position and the wound closed without drainage. If it is impossible to deliver the kidney through the wound decapsulation may be performed, but it is difficult under such circumstances to remove the whole capsule. The dissection should be strictly an extra-peritoneal one.

Experiments upon animals and the results of decapsulation of human kidneys show that the function of the organ is not interfered with by the removal of its fibrous capsule.

In the nine months previous to writing this paper Edebohls performed complete decapsulation, chiefly for the cure of chronic Bright's disease, upon more than fifty kidneys. The lapse of time is yet too short to say what the effect upon the disease will be, but he has demonstrated the comparative harmlessness of the operation (mortality of his latest statistics is 13.7 per cent.¹). In six cases he performed decapsulation for other causes. Two patients with acute pyelonephritis, unilateral in one case and bilateral in the other, were much improved by decapsulation. Both kidneys of a married woman, aged sixty-eight years, who was suffering from acute hemorrhagic nephritis, were decapsulated. The renal hemorrhage ceased immediately after operation. Casts and albumin disappeared in two weeks. In three weeks the patient left her bed apparently well, but contracted pneumonia, and died six days thereafter. Microscopic examination of the kidneys showed them to be practically normal. The remaining cases were intermittent hydronephrosis of one kidney, intermittent pyonephrosis of one kidney, and polycystic degeneration of one kidney. All three patients suffered from chronic Bright's disease. Decapsulation combined with fixation in case of the movable kidneys improved their condition, although Edebohls states that the lapse of time is still too short for a final conclusion.

Schmitt² draws the following conclusions from a study of the published reports of the surgical treatment of Bright's disease:

¹ Boston Medical and Surgical Journal, March 12, 1903. Medical Record, loc. cit.

² Medical Record, New York, September 13, 1902.

1. In acute infectious diseases anuria with uræmic symptoms threatening the life of a patient can be successfully combated by capsular incision or renal cleavage, which relieves congestive swelling and excess of intrarenal pressure. Operation on one side is sufficient to bring about an abundant urinary secretion, followed by a subsidence of the alarming general features. Whether the other kidney gains time to recuperate and regain its function, or whether reflex action plays an important rôle, are debatable points. At all events, nature seems to get along with a small portion of functioning kidney tissue.

2. Anuria with uræmic symptoms occurring in the course of chronic Bright's disease has afforded an occasion for surgical procedure. To recognize such an indication on reasons which are analogous to those above mentioned is, of course, a matter of individual judgment. Temporary relief has in some instances been gained, but a permanent cure has never been effected.

3. When the kidney has been operated upon directly for the cure of chronic Bright's disease, the outcome has been a failure. The apparent benefit manifested in the disappearance of dropsy, dyspnœa, etc., occurs just as regularly in the ordinary course of the treatment by medication and capillary drainage or puncture.

4. In exceptional cases colicky pains and hæmaturia are caused by chronic Bright's disease. Capsular incision or cleavage of that kidney to which these symptoms were traceable has been attended by excellent results. There can be no doubt that when medical expedients have failed surgical interference has succeeded in checking the hemorrhages and alleviating the pains, but it does not inhibit the progress of chronic Bright's disease.

5. Nephropexy may cure the ailments incident to movable kidney. It may remove albuminuria, if this be the result of local irritation consequent upon the displacement; but if the movable kidney is affected by chronic Bright's disease, this affection will remain uninfluenced by the operation.

We believe that the method advocated by Edebohls should be regarded as still in the experimental stage. The admirable paper of William H. Porter¹ attempts to prove that patients suffering from chronic nephritis are still likely to gain more from medicine than surgery. With this opinion we concur. Edebohls' latest results, together with a discussion on this subject, may be found in the *Boston Medical and Surgical Journal*, March 12, 1903, page 287. Of 51 patients operated on, 14 died from twelve hours to eight years after operation ;

¹ Transactions of the Lehigh Valley Medical Association, 1902.

5 died of uræmia and 3 from "acute cardiac dilatation." Ten cases were reported radically cured and 12 greatly improved.

Calculi and the X-ray. Leonard¹ emphasizes the value of the X-ray examination in all cases of suspected renal or ureteral calculi. A radiograph may be of service in showing the exact position of the calculus or the presence of two or more calculi, while a negative examination in his experience is sufficiently accurate to make it unnecessary to incise a kidney in the search for supposed calculus. He has subjected 206 patients to X-ray examination, and in 65 of these patients he demonstrated the presence of calculi, while in no less than 60 calculi were shown in one or both ureters. In only 3 cases in which the result of the examination was negative was a calculus subsequently found, and in 2 of these 3 cases the calculus weighed less than one grain, and was passed spontaneously. Calculi have been shown in patients weighing over two hundred pounds, although under such circumstances more than one radiograph should be made. If the calculus found is of such a size that it will probably pass spontaneously and there is no anuria a conservative expectant treatment is justifiable. Without the X-ray examination such treatment would be unsatisfactory, and might be disastrous.

Renal Abscess and Tuberculosis. Grohé,² in a report of operations upon the kidney performed at Riedel's clinic, mentions three cases of unilateral multiple renal abscess. One of these was shown to be unilateral by autopsy, as the patient died from peritonitis proceeding from the genital organs on the fourth day after operation. The permanent cure of the other two patients seemed to demonstrate the fact that the trouble was unilateral. Microscopic examination of the three kidneys seemed to show that the infection was hæmatogenous in every instance, although in one patient the lesions in the kidney were too far advanced to enable the pathologist to make a positive assertion. The source of the pus in this case was apparently a long-standing suppuration of the urogenital tract. In the second case no cause for the infection could be assigned, while in the third case it followed an abscess of the back.

The results obtained by Riedel after operation for tuberculosis of the kidney are worth mention. Fifteen cases are reported with a mortality in 8, or 55 per cent. The causes of death were tuberculosis of the lungs or of the other kidney, miliary tuberculosis, and in 1 case post-operative peritonitis. Of the 7 patients who survived operation 1 died within three years of extension of the disease to other portions of the

¹ *Medical News*, 1902, vol. lxxx. p. 305.

² *Archiv f. klin. Chirurgie*, 1902, vol. lxxi. p. 178.

urogenital tract, 1 was still under treatment, and 5 were apparently perfectly well at periods varying from two to twelve years after operation—that is, 33 per cent. of apparent cures. Examination of the kidneys which were removed convinced Grohé that a partial resection of the tuberculous kidney except in very rare instances is inadvisable, since portions of the extirpated kidneys which to the naked eye appeared normal were found upon microscopic examination to be markedly affected.

Movable Kidney. McWilliams¹ takes a conservative view in regard to treatment of movable kidney. He agrees with Israel that the only absolute indication for operation is the occurrence of attacks of colic due to traction upon or kinking of the pedicle. In all other cases non-operative methods of treatment are first to be employed, and operation is only to be advised when they have failed.

In laying out a therapeutic line of treatment the first requisite is to ascertain the exact condition of all the bodily organs, more particularly the nervous system, the gastro-intestinal functions, the genital apparatus, the position of the abdominal organs, etc., after which means are applied to combat the abnormal conditions. The patients must be prevented from overanxiety and worry, and are to be encouraged to look for a favorable outcome.

The general health and weight may be increased by the Weir Mitchell rest cure and forced feeding, which will also improve the nervous symptoms. Atony of the abdominal walls, displacement of the intestines, with deficient peristalsis and tendency to gas formation may be combated by massage, gymnastics, electricity and hydrotherapy, bandages and tonics. Long standing should be interdicted. Women whose symptoms, referable to wandering kidneys, are worse at the menstrual period should remain in bed some days before and during the period. General treatment should always be combined with mechanical treatment, which consists in the application of some kind of an abdominal supporter. A cushion alone in front to support the kidney generally will not succeed in holding the kidney in place. Gallant has the patient obtain one of the at present fashionable straight-front corsets, two sizes smaller than usual. The corset is put on before the patient gets up in the morning, with the pelvis elevated, the kidney having been replaced in its proper position. The corset is hooked from below upward.

Up to April, 1902, 61 patients had been operated upon for movable kidney at the Presbyterian Hospital, New York; 2 died as a result of operation, and 1 two months afterward of pulmonary tuberculosis; 42

¹ Medical News, 1902, vol. lxxxi. p. 625.

of the remaining 58 patients were personally examined or written to ; 52 per cent. were cured, 36 per cent. were improved, and 11 per cent. were not improved. These operations were performed by different surgeons. In about one-half of them a strip of fibrous capsule was removed and parenchymatous sutures were inserted. In the rest of the operations sutures were inserted through the fibrous capsule. The percentage of cures was about the same by the two methods of operating.

PERSISTENT HEMORRHAGE FROM A DISPLACED KIDNEY. Cabot¹ mentions a case in which congestion of the kidney due to a downward displacement of the organ causing hemorrhage so persistent that the patient was reduced to a condition of extreme anæmia. There could be no doubt of the diagnosis, for the blood stopped entirely when the patient was kept flat in bed with the feet higher than the shoulders. After some weeks of this treatment, during which the urine was free from blood and the patient gained much in weight and strength, a series of trials were made to determine whether an upright position could be resumed without causing a return of the hemorrhage. Finally, the patient as well as her physician became convinced that this was not possible and an operation was performed. The kidney was found to be freely movable in the fat capsule. Its own capsule was milky-white from fibrous thickening. No other abnormality was observed. The capsule was split longitudinally and its edges stitched to the edges of the transversalis fascia. The operation was entirely successful in keeping the kidney in position and relieving pain and hemorrhage. It is worth noting that this kidney was not twisted upon its pedicle as an axis, but was merely displaced downward.

The Place for Partial Nephrectomy. Rouville and Soubeyran² have published a most complete consideration of partial nephrectomy showing the indications and contraindications for this operation and the results which have followed its employment in the hands of a large number of surgeons. It was formerly supposed that removal of one kidney or of a part of one kidney was followed by hypertrophy of the remaining renal tissue, but it is now generally admitted that the number of glomeruli and tubules is not increased. Any hypertrophy which takes place is simply an increase in the size of the glomeruli and the length and size of the tubules. In this way the functional capacity of the remaining renal tissue may be increased. The writers further show that primary union is often obtained after partial resection of diseased as well as healthy kidney tissue. Primary union ought not to be interfered with by cauterization for the control of hemorrhage.

¹ Boston Medical and Surgical Journal, 1902, vol. cxlvi. p. 243.

² Archives Provinciales, 1902, vol. xi. pp. 559, 608, and 666.

Compression and pressure and suture with large catgut will check bleeding without interfering with repair.

Partial nephrectomy is contraindicated if every portion of the affected kidney is diseased. This is the case in the majority of nephritic troubles, and, therefore, the field of partial nephrectomy is a limited one. A second contraindication lies in the nature of renal affection. Partial nephrectomy should never be performed for malignant tumors. The third contraindication is the permanent occlusion of the ureter on the affected side. Under other circumstances partial nephrectomy is preferable to total nephrectomy, and especially if the condition of the opposite kidney is unknown.

Partial nephrectomy is the operation of choice in the treatment of lesions which are confined to a portion of the kidney when the rest of the kidney is either normal or aseptic. Such conditions will usually not be recognized until the kidney has been exposed. A calculous pyonephrosis is sometimes confined to a portion of the kidney, and it may then be satisfactorily treated by partial nephrectomy. In pyonephrosis not due to calculus there are generally multiple abscesses throughout the kidney. Still, in such cases nephrotomy combined with resection of the portion of the kidney that is most diseased may succeed in curing the patient without the continuance of a fistula. The authors report such a case of their own, and also one in which Waitz attempted to perform complete resection, but failed on account of adhesions, and was obliged to content himself with partial resection. In both of these cases the cure was complete.

In the case of serous cysts the proper treatment is dissection of the cyst, together with such portions of the parenchyma as are attached to it, and suture of the sides of the cavity. This treatment gives a more rapid recovery than simple drainage of a cyst, and saves the patient from the risk of secondary infection. *Echinococcus cysts* should be treated in the same way. They cannot be pulled out, since they are intimately attached to the renal tissue. They should be cut out and the wound sutured. If the cyst has grown outside of the kidney and is very large, one may have to content himself with partial resection of the cyst and drainage, but this operation is inferior to partial nephrectomy. If the kidney is wholly destroyed total nephrectomy is, of course, indicated.

One need not hesitate, in operating upon a paranephritic cyst, to remove with it a portion of renal tissue, should this be necessary to complete the extraction of the cyst.

So far as known partial nephrectomy has been performed six times for malignant tumors. In four cases the tumor rapidly returned. In two cases the immediate result of partial nephrectomy seemed better

than might have been expected for total nephrectomy, but the period of observation was too short to draw satisfactory conclusions. Albarran, who is a believer in partial nephrectomy under certain conditions, says that one ought not to employ it for a tumor of the kidney unless the benign nature of the growth is absolutely known. If such is the case partial resection is indicated, except in those cases in which the whole kidney has been destroyed by pressure.

Paranephritic tumors originate either in the fibrous capsule of the kidney or in its fatty capsule. In the first case a partial resection of the kidney may be necessary; in the second case it will not be unless secondary adhesions have formed. The first partial nephrectomy, as far as known, was performed by Spencer Wells in 1884 for a perineal fibrolipoma.

Traumatism, whether of the nature of contusion or of an open wound, may so injure the substance of the kidney as to make partial resection necessary. Primary nephrectomy should not be performed under such circumstances unless the whole kidney is so injured that its preservation is evidently useless. Parenchymatous hemorrhage may be controlled by a tampon. Hemorrhage from a fissure is best treated by a suture with a not too fine catgut. If a large vessel is torn it should be ligated.

Renal fistula may be cured by resection and suture provided the ureter is pervious or can be made so. Before undertaking this a ureteral probe should be passed from the bladder. Tuffier divides the operation to cure a fistula into three parts: 1. The separation of the kidney from the tissues about the fistula in the soft parts. 2. The dissection of a fistula in the kidney followed by suture of the healthy tissues of the kidney. 3. The dissection of a fistula in the tissues outside of the kidney. This operation will rarely be required, for in most cases if the ureter is pervious irrigation of the renal pelvis from below will be followed by speedy closure of the fistula.

Tuberculosis of the kidney if confined to a portion of the organ may be advantageously treated by partial nephrectomy. Unfortunately, such conditions exist in only a small percentage of cases of renal tuberculosis. The technique of partial resection is usually simple and varies somewhat according to circumstances.

Suspension of the Kidney by its Fibrous Capsule. Goelet¹ says that the fibrous capsule of the kidney is the only reliable structure for holding a suspension suture, and that it is both unwise and unnecessary to puncture the kidney to any considerable depth. His method of operating is clearly shown by the accompanying illustration. (Fig. 39.)

¹ American Medicine, 1902, p. 531.

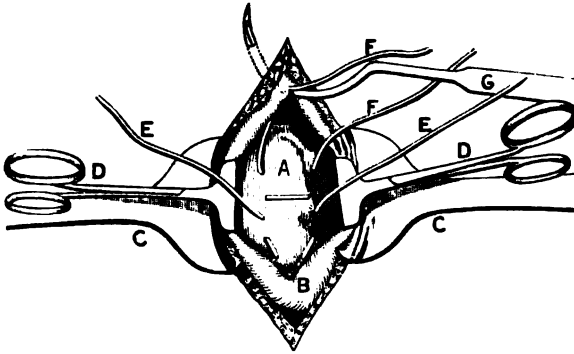
The transverse loop of the suture bears the principle strain. The suture, *E E*, passes under the capsule in three places, and is situated at about the junction of the middle of the lower thirds of the kidney. It is not necessary to denude the kidney of its fibrous capsule in order to secure fixation. (Fig. 39.)

Brödel¹ believes that the following method is the most rational for suspending a movable kidney :

1. The direction of the suture is not parallel to the framework of the cortex, but at right angles to it.

2. The fibrous capsule, being the most resistant structure, is utilized instead of the kidney substance itself to furnish the main support for the suture.

FIG. 39.



Showing details of operation and method of insertion of the sustaining sutures. *A*, kidney. *B*, fatty capsule. *C C*, retractors separating margins of lumbar incision. *D D*, T-forceps drawing out fatty capsule. *E E*, the first or lower sustaining suture. *F F*, second or upper sustaining suture. *G*, needle carrying end of suture from within out through the structures of the back at upper angle of the wound.

3. The suture is passed in a triangular manner through the cortex so as to leave two suture bridges on the surface of the kidney. These bridges bear the brunt of the work, and traction on the suture is borne by them instead of by the circulatory or secretory structures of the kidney. To make this structure tear the bridge must pull the fibrous capsule into the cortical substance of the kidney—a procedure requiring considerable force.

The most important parts of the sutures are the bridges, and these should not be shorter than 7 mm. (0.3 inch). The needle should not sink into the tissue to a greater depth than 6 mm. (0.2 inch), so as to avoid passing below the cortex. Two sutures are sufficient—one as near as possible to the lower pole of the organ, and the other one as

¹ American Medicine, August 2, 1902, p. 177.

FIG. 40.

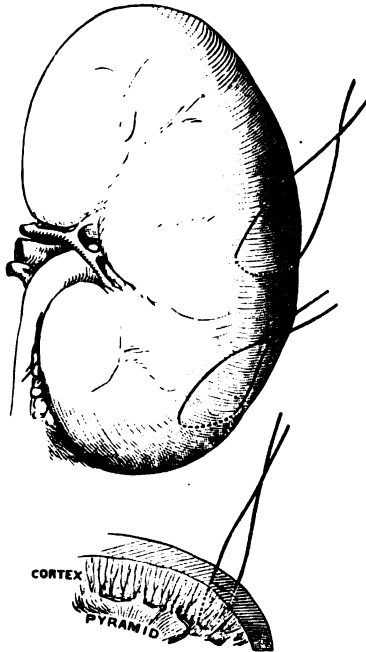


FIG. 41.

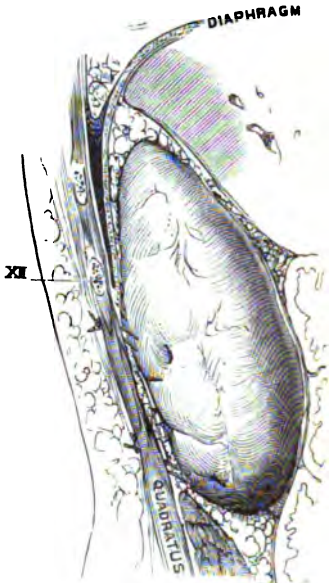
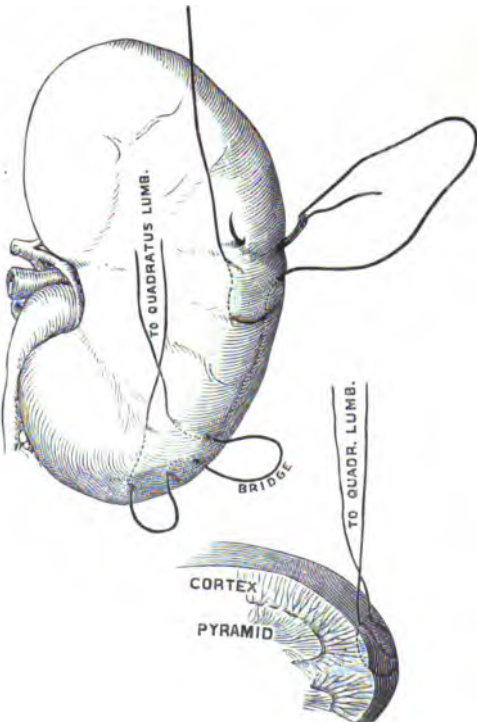


FIG. 42.



high up as the reflection of the pleura makes practicable. These sutures are not inserted along the most prominent curve of the kidney, but rather upon its posterior surface, as shown in Figs. 40, 41, and 42.

Fixation by Irritation. Carwardine¹ secures permanent fixation of a movable kidney by swabbing the whole surface except the hilum with 95 per cent. carbolic acid. The result is a most abundant growth of granulations, which in every one of the six cases in which he has tried this method holds the kidney most rigidly in its correct position. While the granulations are forming the kidney is supported by a temporary suture, or simply by gauze packing.

GENITO-URINARY ORGANS.

Ureteral Stricture the Cause of Renal Conditions. Kelly² remarks upon the little attention that has been given to stricture of the ureter, and the numerous operations that have been performed to relieve the effect of stricture as shown by the backing up of urine in the kidney. Such operating is merely treating the effect while leaving the cause untouched. The term stricture should be reserved for those cases in which there is a narrowing of the lumen due to disease of the ureteral walls. There are, of course, other causes of obstruction, such as pressure of a fibroid or other tumor, calculus, or a twist due to rotation of the kidney. Many of the cases, therefore, which have hitherto been spoken of as "hydronephrosis" or "pyonephrosis" are really cases of stricture of the ureter with secondary changes in the kidney. When these facts are recognized surgeons will be less ready to sacrifice an organ which is not the seat of disease, as even a greatly dilated kidney may be capable of performing much useful work if the obstruction is overcome. Kelly has seen only one case of stricture of the renal end of the ureter, and only one case in which the stricture was in its abdominal portion; in all other cases the stricture was situated in the true pelvis. By far the greatest number of strictures are of tuberculous origin. In women the pelvic portion of the ureter can be palpated through the vagina, and if diseased it will be felt hard and cord-like. The diagnosis rests also upon inspection of the ureteral orifice and upon ureteral catheterization. The methods of treatment are summed up as follows:

1. Dilatation by flexible or metal catheters in a graduated series up to four or five millimetres in diameter.
2. Freeing the ureter from a bed of inflammatory adhesions by dissection.

¹ *Lancet*, 1902, vol. i. p. 1822.

² *Journal of the American Medical Association*, 1902, vol. xxxix. p. 363.

3. Resection of the ureter (rarely possible).

4. Extirpation of both ureter and kidney, which is the only reliable method in tuberculosis and in purulent cases of long duration.

5. Amputation of the ureter and implantation in the bladder. This method of treatment is practicable when the stricture is situated low down, the kidney is still capable of doing some work, and the other side is also diseased.

6. Complete division of the stricture.

As a preliminary to operation the upper urinary tract should be emptied of old urine and pus, and sterilized by injections of boric acid, bichloride of mercury, silver nitrate, or formalin.

SUTURE OF THE URETER. Cabot¹ reports a successful case of suture of the ureter by the end-to-end method. In the discussion of the various methods he says that the transverse end-to-end method sacrifices less of the ureter, but that it is technically difficult and is more likely to be followed by leakage than some other method. The oblique end-to-end method offers about the same advantages and disadvantages as the transverse. Van Hook's end-in-side implantation is easy to perform if there is plenty of slack, and is not apt to be followed by leakage. The end-in-end implantation requires less sacrifice of tissue, and is a most satisfactory method when there is an inch or more of ureter which can be devoted to it. In every case the question of suture of the ureter should be carefully considered before the surgeon resorts to implantation in the skin, rectum, or vagina, and before nephrectomy is performed.

Young² believes that the best method of exposing the ureter for the removal of a calculus is by means of an extraperitoneal iliac incision. This is true for all positions of a calculus except when it is in close proximity to the bladder. Through this incision the kidney can be reached if necessary.

TRANSPLANTATION OF THE URETER. Jacobson³ has successfully transplanted the ureters of a male patient twenty-nine years old. A portion of the mucous membrane was left attached to each ureter and stitched into the wall of the rectum in layers. The area of operation was later covered by peritoneum, thus making the anastomosis an extraperitoneal one. This patient suffered from extrophy and was operated upon without success when a child. The shock following operation was great, but the patient recovered under stimulants and saline infusions. For a time the rectum was greatly irritated by the urine, but it gradually became accustomed to its presence, so that at the time of operation he was able to hold his urine for three hours with

¹ Boston Medical and Surgical Journal, December 11, 1902.

² American Medicine, August 9, 1902.

³ Journal of the American Medical Association, 1903, vol. x1. p. 34.

comfort. It sometimes escaped involuntarily during the night. The abdominal wound became infected, but healed by granulations, and was nearly closed at the time of report. It is interesting to observe that the patient passed one stone from the rectum, the character of which was not determined.

Intraperitoneal Rupture of the Bladder. Jones¹ reports 9 cases of intraperitoneal rupture of the bladder, which, with 45 reported by Alexander,² makes a total of 54 cases treated by suture. In this whole series there were 26 deaths and 28 recoveries—that is, a mortality of 48 per cent. But the mortality of the cases operated upon more than ten years before report was 63.5 per cent., and in those operated upon within ten years of the date of report it was only 27.5 per cent. The chief causes of death are peritonitis and shock, and occasionally a patient dies from hemorrhage. Thus, 17 of the 26 deaths were due to peritonitis; in 4 of them peritonitis developed after operation. The element of elapsed time between the injury and operation seems to be far less important than in the case of rupture of the intestine, for in the second period, with a lower death rate, the average elapsed time was twenty-seven hours as compared with twenty-three hours in the older period. The decrease in the mortality was due not to earlier recognition of the accident, but to improvement in the treatment.

Cases of peritonitis may be divided into four classes: (1) Those in which the bladder is infected when the accident occurs; (2) those in which the bladder and peritoneum are infected by catheterization or by the injection of air or fluid as a test for rupture; (3) those in which the peritoneum becomes infected during operation; (4) those in which the peritoneum becomes infected after the operation by the leakage of urine. Mortality in the first class of cases cannot be greatly reduced. The only hope for such a patient is in immediate operation, and as many of the patients are alcoholic at time of injury there is almost certain to be considerable delay before a surgeon is called.

Careless catheterization or the injection of boric acid or salt solution is responsible for a considerable number of peritoneal infections. Even if the catheter and syringe and fluid employed have been thoroughly sterilized by boiling, bacteria within the urethra may be pushed into the bladder, and, owing to the irritation in the peritoneal cavity caused by the urine, a few bacteria will be sufficient to set up peritonitis. The injection of air as a test for rupture exposes the patient to the same risk, and it may also add to the collapse.

Infection occurring during operation and that due to subsequent

¹ *Annals of Surgery*, 1903, vol. xxxvii. p. 215.

² *Ibid.*, 1901, vol. xxxiv. p. 209.

leakage will sometimes occur even in the hands of the best surgeons. They can, however, be reduced to a minimum by a proper technique.

The best means of preventing death from shock is to shorten the operation by good technique. In some of the cases reported it is stated that the operation lasted two or three hours. This is twice or three times as much time as it ought to occupy.

The prevesical space should first be opened with the patient lying flat on his back. This precaution will sometimes save opening the peritoneal cavity in case the rupture is an extraperitoneal one. If not, the peritoneum should be incised and the patient then placed in a Trendelenburg position.

In suturing the wound in the bladder much time can be saved if the suture is begun at the upper end of the wound and the threads are left long so that each one may be used as a traction thread to assist in the introduction of the next stitch. In this way even the deepest stitches can be inserted without difficulty. Fine twisted silk passed through the serous and muscular coats only is the most satisfactory suture. Some surgeons test the suture line when completed with water introduced into the bladder. This seems an unnecessary delay. In any case the wound should be drained by gauze which, besides facilitating the escape of leaking urine, will aid the sutures in closing the wound by adhering to the walls of the bladder.

Most surgeons have either catheterized their patients or directed them to urinate at frequent intervals. But the series of cases reported is not sufficiently great to say that one method of after-treatment is better than another.

In Jones' two cases the principal symptoms were: 1. Sudden severe pain in the lower part of the abdomen which remained as a constant pain. 2. Constant desire to urinate, with inability to do so. 3. A preference for erect or partially erect position of the body rather than the recumbent. 4. General tenderness, but little or no rigidity. (The abdominal wall was so lax in both cases that it bulged with the pressure of the free fluid in the abdomen.) 5. A small quantity of bloody urine in the bladder. 6. Dulness in the flanks.

Excision of the Bladder. Robson¹ removed the whole of the urinary bladder on account of a universal polypoid condition. The operation was carried out through vertical and transverse suprapubic incisions. The peritoneum was peeled from the fundus of the posterior wall and the bladder was separated from the uterus and vagina. The vesical arteries were clamped and divided. The ureters were divided close to the bladder, and after the bladder had been removed they were

¹ *British Medical Journal*, 1902, vol. ii. p. 1519.

implanted into the vagina. The operation lasted one hour and a quarter, and the loss of blood was not great. The patient died on the thirteenth day after operation of uræmic infection due to suppuration in the left kidney, present at the time of operation.

Return of the Testes to the Abdomen. Eccles¹ says that the testis, and particularly the normal testis of a boy at or near puberty, possesses two types of cells—one for the development of spermatozoa and the other for the production of an internal secretion. Both of these functions are of high importance to the individual, and the treatment of imperfectly descended testis should respect the organ as far as possible. If the testis is found in the inguinal canal, as is frequently the case in operation for hernia, three plans are open to the operator: first, to bring the testis into the scrotum; second, to return it into the abdomen, making it permanently an abdominal organ, and, third, to remove it altogether. In many cases it is difficult or impossible to bring the testis into the scrotum. Simply to bring it in front of the body of the os pubis is only to place it where it is likely to cause more discomfort than when it is in the inguinal canal.

Abdominal transplantation has been objected to on the ground that it is likely to undergo malignant degeneration, but proper evidence to support this statement is wanting. The radical cure of a hernia is equally easy, whether the testis is replaced in the abdomen or removed. Even if the replaced organ does not develop so as to be sexually active it is probable that it is of some benefit to the organism by producing an internal secretion. If these reasons are valid in the case of a single testis abdominal transplantation is even more strongly indicated when the trouble is bilateral.

The rule, therefore, should be to bring the testis into the scrotum if it can be easily accomplished, and there is a reasonable probability that it will not retract. Under other circumstances it should be returned into the abdomen unless there are special reasons for its removal.

¹ British Medical Journal, 1902, vol. ii. p. 1314.

GYNECOLOGY.

By JOHN G. CLARK, M.D.

CANCER OF THE UTERUS.

As stated in previous years, it is my intention to give a digest of the latest papers upon all phases of cancer of the uterus, for this is the one gynecological disease which has resisted all forms of treatment and stands as a reproach to the abdominal surgeon.

This year we have arranged the subjects topically, so that all special points may prominently be brought into the foreground.

Etiology. Two years ago Leopold's article on the parasitic origin of cancer was extensively reviewed. This year a very interesting paper upon the development of cancer from the histogenic viewpoint has appeared. Israel¹ observes that the recent work of Feinberg upon the etiology of carcinoma agrees with Foa, who, in 1892 and 1893, described parasites of carcinoma that were long since recognized as being vacuolized products of degeneration. These bodies were fixed and stained by Foa just as they were by Feinberg, and principally in mammary carcinoma.

The alleged "cultures" of Nils-Sjoberg, which he, in 1901, laid before the Surgical Congress, represent nothing but macerated fat tissue from the decomposition of which the "rhizopods" of the author resulted. On account of their resemblance to fat, which Sjoberg did not deny, he called them "pimelodia." The amœboid movement observed in them is nothing more than a physical process resulting from the saponification of fat in an alkaline culture medium.

Israel believes that the cause of carcinoma can be sought only in the histogenesis and biology of epithelium and endothelium. After the embryological development of the epithelial or endothelial covering, the cells remain inactive except when their multiplication is necessary to cover some area that has become bared. More proliferation than is necessary to make up for the defect is common. There also occurs a surface accumulation of epithelium which is accompanied by a papillary growth of the underlying tissue (condyloma acuminatum). So long as the connective tissue and epithelial proliferations remain of the same grade and distinct one from the other, the growth is benign; but if the

¹ Die Probleme der Krebsätiologie. Archiv f. klin. Chirurgie, Bd. lxxvii.

activity of the epithelium is greater than the resistance of the connective tissue, the epithelial cells penetrate into the lymph spaces of the latter and form the earliest stage of carcinoma. From this first stage to that of metastasis there is a continual sequence of growth. The primary surface proliferation must possess not only the ability to form the entire structure of the growth (for the connective tissue is only secondarily involved), but it must also be able to replace those cells which are destroyed in the meshes of the connective tissue by reason of a limitation in space and nourishment.

It is to be observed in young carcinomata that the epithelium in the neighborhood shows a papillary proliferation which in itself could not be called carcinomatous. The cause of carcinoma, then, must be sufficient to produce an epithelial proliferation that is able to overcome the resistance of the underlying connective tissue. Israel believes the incentive to such a proliferation is analogous to the procreative activity that is observed in the lower forms of life when they are exposed to difficult conditions for growth. For example, a destruction of some of the epithelial cells upon a surface produces an increased activity of those remaining in order to replace the defect. Through repeated insults which result each time in proliferation of the epithelium a condition is finally reached in which, from the more or less permanent irritation, the cells take on an abnormal activity of growth. In this light carcinomata cannot be looked upon as infectious growths; they are rather the result of repeated epithelial insults produced by chemical and mechanical means, and perhaps, indeed, the irritative action of micro-organisms.

Glandular Metastasis. Gellhorn¹ has made a very excellent review of the literature upon the treatment of carcinoma of the uterus so far as it depends upon the involvement of the lymphatic system. The uterus is richly supplied with lymphatics; these anastomose freely, and may be divided into those of the cervix and those of the corpus. The former follow the course of the uterine artery and empty into the upper group of hypogastric glands lying at the bifurcation of the common iliac arteries; the lymph channels of the upper vagina also empty into these glands, but usually into the lower group. The majority of lymph radicles supplying the corpus uteri follow the course of the ovarian arteries and empty into the median group of the upper lumbar glands. Groups of radicles also run from the uterine horns out along the round ligament and discharge into the upper inguinal group of glands. It is unnecessary to state that anomalies in the lymphatic distribution of the pelvis are not uncommon.

¹ The Lymph Glands in Uterine Cancer. *American Gynecology*, November, 1902.

Cancer is, in its beginning, a localized new-growth, originating either in the squamous or cylindrical epithelium of the cervix or else from that of the uterine cavity. The cells first invade the tissue spaces and extend along them to the lymph channels lined by endothelium.

How often the cancer cells are transported through these vessels in the lymph stream and deposited in glands more or less removed is an unsolved problem. There are some who believe that such an occurrence is very rare, and that the glands are found involved only when the growth has extended along the lymphatic spaces for a considerable distance into the parametrium. The direction of the extension varies in the two forms of cervical disease.

Ernst¹ has called attention to the extension of carcinoma along the lymph spaces of nerves. This may occur from carcinoma in any region and from cancer of the uterus in the plexus sacralis. The lamellæ of the nerve sheath are torn apart by the carcinoma cells which cover the surface of the connective tissue membrane like surface epithelium, and even lead to the formation of gland-like spaces. The nerve fibre itself is divided by the invading cells and the medulla of the fibre undergoes atrophy. This observation is of great clinical significance, for it further explains the intense nerve pains from which these patients suffer in the later stages of cancer. According to this view the agony is not due alone to pressure, but to actual involvement of the nerve.

Gillhorn observes that carcinoma of the portio vaginalis extends first to the vaginal wall and thence to the parametrium, whereas carcinoma of the cervix proper extends directly through the uterine wall to the parametrial connective tissue. The immense amount of labor that has been expended upon a study of this subject lies in the fact that its thorough elucidation must be the guide to a correct operative treatment for carcinoma. Such operative procedures must remove all carcinomatous areas so far as is possible and consistent with the well-being of the patient. The question is not so important in advanced cases of carcinoma of the uterus where the entire pelvis may be more or less involved, and in which operation is proportionately hopeless. Its importance lies in early cases of disease, whether in such cases the attempt of the operator should be to remove alone macroscopically diseased uterine, vaginal, and cellular tissue or the lymphatic glands as well. The problem has many sides:

1. How often are lymph glands the seats of metastasis in early cases of carcinoma?
2. What indicates their involvement? Is an absence of enlargement

¹ Verbreitung des Carcinome in der Lymphbanen der Nerven. Centralblatt f. Gynäk., 1902, No. 38.

any indication that they are free from the disease? Is their enlargement a sure sign of their carcinomatous involvement?

3. Is it possible to recognize enlargement of lymph glands without exposing them by operation?

4. In case of early carcinoma of the cervix with metastasis to the glands, is it likely that carcinomatous deposits also exist along the course of the lymphatic radicles?

5. Does the condition of the parametrium as determined by clinical examination permit any conclusion as to the involvement or non-involvement of the glands?

Regarding the percentage of glandular involvement in uterine carcinoma exact data are somewhat scant. Autopsy findings throw no true light upon this question. In such cases, of course, the percentage of glandular involvement is high, for the disease is far advanced. Our conclusions must be drawn from the examination of lymphatic glands removed in early cases of carcinoma. Statistics upon this point have to be criticized before they can be accepted. The exact extent of the disease must be given, and unless the glands have been subjected to histological examination an opinion as to their involvement is quite useless. The care and completeness with which such an histological examination is carried out (serial sections) also is of vital importance. Thus, Wertheim reported twenty-two cases of "early" carcinoma of the cervix in which the glands were involved five times, or in over 22 per cent. of the cases; but Jordan and Schuchardt, who have scrutinized carefully the reports of Wertheim, drew very different conclusions. In one of the cases described by Wertheim as "beginning" the left parametrium was found upon histological examination to be affected; in another case described as "moderately advanced" the right vaginal vault was involved. Jordan concludes from the cases of Wertheim, Funke, and König that "when in cancer of the uterus involvement of the glands takes place it usually occurs in the later stages of the disease, but involvement even then is comparatively rare.

Schuchardt infers from Wertheim's reports that among twenty-nine cases the glands were diseased eight times, but only twice where there was an intact parametrium. Gellhorn believes that we approach the truth in the opinion of Cullen, that in the early stages of carcinoma of the cervix the glands are rarely involved, and that the growth must extend far out into the broad ligament before extension into the lymphatic glands can take place. His views are supported by Winter, Boldt, Beckmann, Pfannenstiel, Döderlein, and Clark. Kelly has recently, in the light of these investigations, given up the extirpation of the lymph glands in the carcinoma operation, and confines his effort

to as wide a resection as possible of the uterus, vaginal vault, and parametrium. With regard to the glandular metastasis in carcinoma of the fundus uteri the authorities agree that it is very rare, and only in the presence of advanced disease. It is further to be asked, do we possess trustworthy macroscopic criteria as to the involvement of the lymphatic glands? A positive answer upon this point is impossible. Even upon histological examination the determination whether a gland is the seat of metastasis may require the most painstaking study of serial sections. Thus, Ries looked over 700 sections in one of his cases before coming to the metastatic area, and he says that in order to make sure that there is no cancerous involvement the entire gland must be cut serially and each section examined. He found carcinoma nests in glands the gross appearance of which appeared perfectly normal in three instances. Wertheim, in contradistinction to Ries, has never found carcinoma in glands which showed neither enlargement nor induration. Most of the affected glands are more or less enlarged, indurated, and of a grayish-white color on section; but the enlargement of a gland does not necessarily indicate that it is carcinomatous. In this Ries, Döderlein, Wertheim, Contois-Suffit, Pfannenstiel, and others agree. Contois-Suffit distinguishes three types of glandular involvement in connection with carcinoma:

1. Healthy but hypertrophied glands producing leucocytes which, perhaps, have a protecting rôle.
2. Those infected by pyogenic organisms from the ulcerating tumor.
3. True carcinomatous glands.

As to the number and location of the glands affected in an individual case, Wertheim says that only in a minority of the cases are several or many glands involved simultaneously. Usually but one or two glands are affected. Gellhorn has not been able to find that this statement of Wertheim has been disputed. In view of this fact, how is the operator to know whether and where he will discover suspicious glands? The consensus of opinion seems to be that bimanual palpation before operation is insufficient to determine if enlarged glands exist in a given case. Under full relaxation by anæsthesia and recto-abdominal palpation Winter says that enlarged pelvic glands may be felt, but he mentions it only as being within the range of possibility. Wertheim, in eleven cases of glandular involvement, was able to determine it but three times. Von Rosthorn claims that only considerably enlarged glands lying near or upon the iliac vessels are palpable. Less markedly swollen glands escape the touch even after the abdomen has been opened. They are only detected by splitting the peritoneum and digging out the fatty tissue between the bladder and the bifurcation of the iliacs. Pfannenstiel also has had this experience, and Kroenig says

that glands up to the size of a pigeon's egg may escape observation before operation.

Some operators who lay great emphasis upon the extirpation of all glands seem to ignore the lymph vessels leading to or communicating with these glands. Mackenrodt, H. W. Freund, and Russell have each found carcinomatous involvement of these lymph radicles.

Kermanner and Lameres made similar observations, and Veit was able to demonstrate in serial sections that normal lymph vessels sometimes alternated with malignant tracts. Finally, we may ask what evidence does the clinical examination of the parametrium afford as to the likelihood of glandular involvement? At the outset it must be remembered that an indurated parametrium does not always indicate carcinomatous extension. Wertheim found no relationship between the condition of the parametrium and the condition of the glands. Some other observers do not agree with him in this. Puppel, Pryor, Kelly, Pfannenstiel and Döderlein believe that the disease only affects the glands after it has advanced considerably into the parametrium, and Gellhorn believes that in the majority of cases the clinical condition of the parametrium affords a valuable indication of glandular involvement. Upon these facts which have been recounted, Gellhorn says the advocates and adversaries of the abdominal radical operation base their arguments.

Some operators, as Ries, Clark, Russell, Humiston, Pryor, Mackenrodt, and Amann, have advised the removal of all pelvic glands. Others, as Wertheim, confine their efforts to such glands as are palpably enlarged. Still others, as Kelly, remove as much as possible of the vagina and parametrium and disregard the glands entirely. The theory of the removal of all the lymphatic glands in cases of carcinoma of the uterus is unimpeachable, but there arises the grave question whether it can be carried out without serious risk to the patient's life. Olshausen, Hofmeier, von Ott, Richelot, Carstens, and others deny this possibility. Nearly all post-mortem records show that whenever carcinomatous glands were removed during an operation still others were overlooked. Küster, who has done much in the development of the abdominal operation, is very skeptical as to the possibility of the radical ablation of glands. Wertheim, because he never found glands carcinomatous that were normal in size, confines his efforts to the removal only of palpably enlarged glands. Konwer, Döderlein, Zweifel, Werder, Menge, Kroenig, and Clark agree with him. Kroenig refers to the investigations of Peterson, who showed that after the extirpation of the primary carcinoma, small metastatic growths, especially in the lymph glands, may be destroyed by the natural defensive agencies of the human organism. Second, Kelly, Jordan, and others reject the

analogy between carcinoma of the breast and that of the uterus. The uterus does not possess an isolated lymphatic system as do the mammae. Cullen believes metastasis of the carcinoma cells in uterine cancer occurs less frequently and less early than in mammary carcinoma, because the cancer cells are larger in this organ—in all probability too large to enter the lymph radicles. Hence, the growth must extend to the broad ligament and break into a large lymph channel before the cells can reach a lymph gland. Jordan rejects the analogy altogether, and would look upon carcinoma of the uterus as upon carcinoma of other abdominal organs, and leave out of consideration any attempt to resect the lymphatic glands.

Diagnosis of Operability. Kroenig¹ believes that every effort to determine before an operation for carcinoma, whether it may be entirely extirpated, should receive careful consideration. The prognosis of such cases, where the operator finds, during an operation, that the measure must be incomplete, is not good. In cervical carcinoma it is often difficult to determine whether the vesical wall has been invaded by the growth. Winter was the first to show that the cystoscope often reveals in a given case whether or not the bladder was affected. Zangemeister has given the results of his observations in regard to this question, with which Kroenig does not entirely agree. Zangemeister has divided the cases into three classes. In class 1 he finds, on cystoscopic examination, simply a dislocation inward of the side of the bladder or upward of the base. These are operable. In class 2 are included those in which the mucosa of the bladder shows transverse folds, bullous oedema, and a marked projection of one or both ureteral orifices. From this picture he concludes that the case is probably inoperable, and that the separation of the bladder or uterus from the surrounding tissue would be very difficult or very dangerous. Here Kroenig objects that bullous oedema is often but an accompaniment of inflammatory diseases of the uterus and its adnexa. In a case of suppurating carcinoma we dare not conclude, therefore, from a bullous oedema that the disease extensively involves the bladder wall. Kroenig has had such cases in which the separation of the bladder from the cervix was accomplished without difficulty. He believes, furthermore, that the transverse folds of the mucosa are equally unreliable as an indication of the involvement of the bladder wall. The preparation which Zangemeister showed to prove his second classification was certainly an inoperable carcinoma, but not because it had involved the bladder. Under the third class Zangemeister includes those cases where

¹ Diskussion zu dem Vortrage des Herrn Zangemeister: über Blasenveränderung bei Portio und Cervix Carcinomen; Berichte aus Gynäk. gesellschaften u. Krankenhäusern. Central. f. Gynäk., 1902, No. 36.

nodes, papillary growths, and ulcerations are found on the mucosa. He styles them inoperable. Kroenig believes this classification would be justifiable if we were able to tell the character of these alterations. They may be malignant; they may be simply inflammatory. Covered as they usually are by incrustations, it is exceedingly difficult to answer this question. Kroenig believes these observations of Zangemeister to be in the main reliable, but he would guard against too sweeping conclusions from a cystoscopic examination. Catheterization of the ureters he would regard as a more reliable indication of whether the ureters were involved in the carcinomatous growth, and whether they could be safely enucleated from the diseased parametrium.

Radical Treatment. Kroenig¹ says that in recent years two advances have been made in the subject of uterine carcinoma. First, we know more definitely through Wertheim of the glandular metastases, and, secondly, new forms of operation have been developed which permit of a more extensive removal of diseased structures than had been heretofore attempted. The frequency of glandular metastases in cervical carcinoma has led to the question as to how widely they may be removed. The recommendation of Peiser is to remove the entire system of lymphatic glands. This is almost if not entirely impossible technically, and, moreover, it appears quite unnecessary. The researches of Petersen have indicated that partial healing of carcinomatous glands is possible and that after removal of the original tumor and the glands palpably affected the possibility of cure is not to be denied. There seems to be no reason to attempt the extirpation of lymph channels, for although these convey carcinoma cells from one gland to the next there is no tendency to further development along the course of the vessels themselves. One disadvantage of the vaginal mode of radical operation for carcinoma is the fact that the very nature of the procedure bars any extirpation of carcinomatous glands. It is a fact that enlarged iliac glands up to the size of a pigeon's egg may not be detected in the ordinary bimanual palpation, and are only discovered when the abdomen is opened. A further advantage of abdominal hysterectomy is this: that the resection of the parametrium may be much more extensive after one has freely exposed and pushed away the ureters. The anatomical studies of Tandler and Halban have shown that in vaginal hysterectomy, when the bladder is separated from the cervix and held forward by means of a speculum, the relation of the ureters to the cervix remains practically unchanged. At the point where they cross the uterine artery they are firmly embedded in the

¹ Zur Technik der abdominalen Totalexstirpation des carcinomatösen Uterus. *Monats. f. Geburts. und Gynäk.*, Band xv., Heft 6.

parametrium and slung around the vessel. Schuchardt, by his paravaginal incision, has sought to remedy this defect in the Czerney operation by exposing and pushing to one side the ureters. It is unnecessary to point out that such treatment of the ureters is more certainly, safely, and completely carried out during an abdominal operation. Kroenig would emphatically divide the simple abdominal hysterectomy of Freund from the abdominal hysterectomies of Wertheim and Mackenrodt, who isolate the ureters, remove involved glands, and dissect widely the parametrium. It is a great mistake to compare the vaginal operation with the abdominal without reference to the variety of the latter operation.

The one objection to the procedure of Wertheim was the shockingly high primary mortality in his first series of thirty cases. But this is more or less the rule in the development of the technique of any new operation, and Wertheim, in his last series, showed a decrease in the death rate. Also v. Rosthorn, at the Giessener Congress, reported a series of abdominal cases after Wertheim, in which the mortality was little greater than in the vaginal operation. Wertheim's other mistake in his first series of cases was undoubtedly an improper estimation of the possibilities of his operation—*i. e.*, taking cases that were too far advanced. It is well known that the abdominal operation makes possible hysterectomies that would be hardly undertaken by the vaginal route. In other words, difficult cases by the vaginal route are easily operable by the abdominal procedure. As has been previously pointed out, it is possible in the abdominal hysterectomy after isolation of the ureters to remove broad areas of diseased parametrium. But the danger of necrosis of the ureter is so great when they are widely separated from their attachments that, in the interest of the patient, the limit of operability in carcinoma should not be too widely extended. If this is borne in mind the primary mortality among good surgeons will soon be reduced to that of the vaginal operation. Mackenrodt, in his abdominal hysterectomy for carcinoma, follows the same principles as Wertheim, but varies from him somewhat in his technique. He makes his operation more or less extraperitoneal by uniting the peritoneum of the anterior belly wall to the posterior parietal peritoneum early in the operation. He exposes the glands, not by division of the peritoneum over them, but by pushing aside the parietal peritoneum and approaching them from the iliac fossæ. Through this separation of the peritoneum with that of the ureters, Mackenrodt obtains a more perfect exposure of the parametrium and the glands to the inner side of the *arteria hypogastrica*. He evidently, however, overrates the dangers of peritonitis from the intraperitoneal manipulation, and underrates the possibilities of infection of the large area of unprotected cellular tissue

that he leaves exposed at the conclusion of his operation. Kroenig has in general adopted Wertheim's technique, but he believes in an improved form.

The dangers of the Wertheim operation are three:

1. Necrosis of the ureters.
2. Persistent postoperative cystitis.
3. Connective tissue inflammation.

The danger of necrosis of the ureters has already been lessened. Through the researches of Feitel and Tandler and Halban we learn that the ureter in its pelvic portion is supplied by a special artery—the *arteria hypogastrica*. Clinical observations do not bear out the constancy of this arterial supply, and Kroenig has observed two cases in which the *arteria hypogastrica* was obstructed, and yet the nutrition of the ureter remained unimpaired. He believes, therefore, that the nutritive supply of the ureter is largely derived from its peritoneal covering. In a résumé of his recent investigations, Feitel lays especial stress upon this point. Wertheim has recently altered his operation in conformity with these views, and now incises the peritoneum, not directly over the ureter, but to one side. Kroenig pushes aside the ureters with a broad flap of peritoneum. Tandler and Halban have shown that while the ureters are separated from the anterior layer of the broad ligament by almost the thickness of the parametrium, they lie in close relation to the posterior layer and are often discernible through it. Kroenig, therefore, exposes the ureters in a peritoneal flap made by an incision parallel, but to the outer side of the ureters at the base of the broad ligament. This incision not only exposes the ureters and the large vessels of the area, but also gives free access to the glands on the inner side of the internal iliac artery. At the conclusion of his operation, Kroenig has exposed the following raw areas: the parametrium; the glandular area at the sides of the pelvis; the bladder wall, where it has been separated from the cervix and upper portion of the anterior vaginal wall, and the rectum, where it has been separated from the posterior vaginal wall. He covers the raw areas and drains the cellular tissue extraperitoneally in a very ingenious way. The edge of the cut anterior vaginal wall is united to the anterior peritoneal flap where it lies free from the bladder. The cut edge of the post-vaginal wall is united to the peritoneum at the bottom of Douglas' cul-de-sac. The excisions exposing the glandular area are united over rubber drainage tubes passing out through the vagina. Finally, the anterior flap of peritoneum is sewn over the vaginal opening. The drainage tubes answer the double purpose of draining the area of operation extraperitoneally and allowing the free escape of urine in case of subsequent necrosis of the ureters. The raw area of the bladder is entirely protected.

Pozzi¹ inclines to the belief that vaginal hysterectomy affords as good results as any of the abdominal methods, and that, therefore, the abdominal operation, being more dangerous, is unnecessary. He gives statistics as follows: In France 95 cases of abdominal hysterectomy have been published with 26 deaths, a mortality of 33 per cent.; elsewhere two series, one of 165 cases with 54 deaths, 34 per cent., and 168 cases with 52 deaths, 34 per cent. Altogether 418 cases with 132 deaths—a mortality of 31 per cent. Pozzi's own death list in 34 cases was 26 per cent. Winter found for Germany a rate of 24.6 per cent. At the Giessener Congress better results were reported by Hofmeier, Amann, and Freund.

The mortality of the vaginal operation is much lower. In 46 cases Pozzi himself lost 7 (15 per cent.); Winter has collected 969 cases with 73 deaths (7.5 per cent.); French operators (Bouelly, Segond, Riche-lot, Schwartz, Quènu), in 430 cases, 55 patients (12 per cent.); other authors (Ott, Schauta, Zweifel, Herzfeld, Sängner, Jandrin, Burckhardt) report 739 patients with 47 deaths (6.5 per cent.). At the Giessener Congress even a lower percentage—5.5 per cent.—was reported by Fritsch, Döderlein, Chrobak, and Amann. With regard to the prospect of cure for carcinoma through operation, among 204 cases he is able to report but 2 as free from recurrence—1 after six years, 1 after ten. He agrees with Winter that one dare only speak of a permanent cure after the lapse of eight to ten years. His rather pessimistic conclusions are: By the surgical treatment of carcinoma there is almost no hope of permanent cure. The disease usually returns in two years, exceptionally not for from four to six years. No case of carcinoma is suitable for hysterectomy in which the disease is not strictly confined to the uterus. If the disease has overspread the bounds of the uterus; if the latter is fixed and not freely movable; if there is infiltration of the neighboring parts; then the palliative operation (repeated curettage and cauterization) is indicated. The lymph glands in their importance are overestimated. They do not cause compression of the ureters nearly so often as the infiltrated parametrial tissue. The recurrences of carcinoma do not take place in the glands, but at the site of the operation, where the cicatrices harden and undergo ulceration. For these reasons Pozzi would reserve abdominal hysterectomy to those cases where there was some indication from the procedure aside from the carcinoma itself, as, for instance, in atrophy or narrowing of the vagina or in the presence of complications, such as fibroid tumor, adnexal disease, etc.

Mackenrodt² gives his indications for operation as follows: For

¹ Die Chirurgische Behandlung des Uteruscarcinoms. Vom IV. internationalen Gynäkologenkongress in Rom. Central. f. Gynäk., 1902, No. 45.

² Ibid.

portio and corporeal carcinoma in the earliest stages a properly conducted vaginal hysterectomy will suffice. The base of the parametrium must always be included, even if for this a vaginoperineal incision is necessary. The glands in these earlier stages are not involved. Recurrences occur mostly from implantation of cancer cells during the operation. To prevent this the operation should be performed only with the thermocautery. From his cases so treated 72 per cent. remain cured after five to eight years. Cervical carcinomata, even those apparently just beginning, must be removed by the abdominal route. Portio carcinomata, even though apparently well localized, if the symptoms have existed for some time, and old corporeal cases, must also be submitted to the most thorough abdominal extirpation. The reasons for the latter view are:

1. The necessity of complete dissection of the parametrium after good exposure of the ureters.
2. Resection of the bladder at that area where it lies in relation to the internal os is often necessary, for at this area quite early infiltration may occur.
3. The frequent complications in the small pelvis demand a good exposure of the parts.
4. The danger of implantation metastases can be much more easily minimized by the abdominal route.

Perhaps the chief objection to the vaginal method is presented by the necessity of extirpating the lymphatic glands. The frequency of glandular involvement, even in early cases, has been proved by careful histological examination. The metastatic carcinoma cells, on the one hand, may be dead and simply give rise to adenitis; or, on the other, they may be so few as to give no positive assurance of their carcinomatous nature. Therefore, in the operation one cannot be sure that enlarged glands are carcinomatous or that apparently normal glands are not carcinomatous. Wertheim's practice of removing only those glands palpably enlarged is, therefore, irrational. His assertion, also, that the glands most important to remove are those of the great vessels does not agree with Mackenrodt's experience. He found the glands earliest involved to be the internal inguinal glands and those embedded in the parametrium about the obturator nerve. The affected lymph glands may even include those of the lumbar regions, but such cases must be hopeless. Nevertheless, in the operation all of the pelvic glands, enlarged or not, should be extirpated as far as possible. The extirpation should include:

1. Internal inguinal glands.
2. Obturator nerve glands.
3. Round ligament glands.
4. Glands of the great vessels.

To reach the internal inguinal and obturator glands the border of

the bladder must be lifted from its attachments on both sides. Finally, through pushing downward of the parietal peritoneum the iliac glands, and in the most radical cases the aortic glands, must be exposed. To prevent implantation metastases, Mackenrodt tampons the upper vagina and cervix after thorough curettage with 10 per cent. formalin. This is left *in situ* for twenty-four hours preceding the operation. In an abdominal hysterectomy with resection of the parametrium and extirpation of the glands there is a considerable area of cellular tissue exposed, and the danger of infection of this area is only to be neutralized by thorough and complete drainage in every direction. Such drainage is impossible in the operation devised by Wertheim, and the complete extirpation of the glands is attended with great danger. Wertheim's primary mortality was high on this account, and his recent improvement in immediate results is not due to perfected technique, but to a limitation of this procedure. What once was Wertheim's operation is now but a Freund operation, with the extirpation of a few enlarged glands. Nearly all of Wertheim's recurrences, as he himself says, have been in the glands. If the glandular extirpation is not complete the vaginal operation had better be employed, for then it is just as good and much less dangerous.

The technique of Mackenrodt's operation may be briefly described as follows: The incision is tongue-shaped, dividing the recti transversely above the symphysis and extending along their outer borders as high up as the anterior superior iliac spines. The peritoneum is opened transversely above the bladder at the lower margin of the tongue-shaped flap, in which it has not been included. The uterus is drawn through the opening, the adnexæ are tied off, and the peritoneum of the tongue-shaped flap is pushed backward and united along its edge with the peritoneum of the posterior pelvic wall from the adnexal stump of one side to that of the other side. This shuts off the abdominal cavity from the true pelvis, and renders the further procedures extraperitoneal. The further steps in the operation include a thorough exposure of the ureters and of the uterine arteries; the removal of the uterus with the upper portion of the vagina, and a considerable portion of the parametrium.

This part of the operation is completed by placing a gauze drain in the vagina and attaching over it the peritoneum of the bladder to the posterior pelvic wall, as is customary after the ordinary abdominal hysterectomy. Upon either side in succession the peritoneum is now stripped off from the abdominal and pelvic walls below the lines of the incision and access thus gained to the lymphatic glands lying at the bifurcation of the iliac, at the internal ring, along the round ligament, and the obturator and hypogastric nerves. With the glands is ex-

tirpated the fatty and the connective tissue in which they are embedded.

The entire area thus exposed on either side is drained after the manner of Mikulicz, through the lateral angles of the tongue-shaped incision. Care is taken to stick the drainage material into every recess. The recti muscles are now joined at their divided ends above the symphysis by means of silver wire, and the operation is completed with interrupted sutures of silkworm-gut. In the final steps of this method the ureters are not separated from the peritoneum, but are pushed to one side still attached thereto. Mackenrodt has had two series of these operations. In the first, consisting of 15 cases, there were 4 deaths. The causes of death were faulty drainage and imperfect technique. In the second series of 17 cases he had but 2 deaths—a percentage of 11.7 per cent. In view of the thoroughness of the procedure this proportion of immediate fatalities dare scarcely be considered too high.

Zweifel¹ reports 33 radical abdominal hysterectomies with respect to the glandular involvement. Carcinomatous glands were found in 21.92 per cent. Palpable glands were not present in 37.5 per cent. The infected glands occurred for the most part in those cases where the disease had progressed into the parametrium, but upon one or two occasions they were diseased even in apparently beginning cases. While Zweifel believes the careful extirpation of the glands will improve the ultimate results, he does not share the enthusiasm of Wertheim and Jounesco. The general surgeons have for a long time been removing the axillary glands in amputation of the breast for carcinoma, and their results have not been so good as those of the gynecologists with the vaginal hysterectomy. He cannot share with Wertheim the belief that with the improved form of radical operation the percentage of cures in all cases will be increased to 20 per cent. For a betterment of the results it ought to be widely known that any woman who presents the slightest irregularity in her menstrual flow should present herself to a physician for examination.

Amann² affirms that he and Mackenrodt were the first to employ the extraperitoneal route in the radical operation for carcinoma. The technique of both operations is about the same, but Amann has recently developed three changes in his earlier work which are worthy of note:

1. He believes that the nutrition of the ureters depends somewhat upon that of the bladder, and it is certain that many cases of post-operative cystitis are due largely to the impoverishment of its blood

¹ Central f. Gynäk., 1902, No. 45.

² Zur Technik der transperitonealen Exstirpation des carcinomatösen Uterus mit Beckenausraumung mit besonderer Berücksichtigung der Ureterdeckung und der Drainage der Beckenhöhle. Monat. f. Geburts. und Gynäk., Band xvi., Heft 3.

supply. The main vesical artery comes from the anterior branch of the internal iliac, often from a common trunk with the uterine. This artery, in the complete radical operation, is in great danger, so that Amann makes a point of locating it and holding it out of harm's way.

2. In order to nourish the ureters and to keep them out of the drainage areas, where they would be pressed upon by the drainage material, he makes an especially large flap of vesical peritoneum and covers the ureters with this, placing them in the paravesical connective tissue and along the rectal wall. This position along the rectum is much more favorable for their nourishment than when they lie against the pelvic wall.

3. The drainage in these extensive extraperitoneal cases is of prime importance. Of equal importance is the manner of instituting drainage, which should in no wise cause pressure upon the ureters. Amann does not use vaginal drainage extensively, for the gauze and rubber tubing as employed by others causes too much pressure upon the ureters near the vesical outlet. After placing a few small strips of gauze in the vagina to drain the angles of the incisions and the upper lateral pelvic area, he inserts, from the depth of the pelvis on either side out through the vagina, rubber or glass drainage tubes. These drain the field of operation perfectly and interfere in no way with the ureters.

Kleinhans¹ reports thirty-two cases of uterine carcinoma in which he performed the radical abdominal operation after the method of Wertheim. Among this series he had but three deaths. The glands were in each case removed when found enlarged. Of these 28 per cent. were found carcinomatous. The percentage of other authors is given: von Rosthorn, 57.5; Wertheim, 31.5; Zweifel, 30; Döderlein, 26.8.

The glands are early involved according to Kleinhans. It is often most difficult to distinguish between inflammatory and carcinomatous invasion of the parametrium. The consistency and the macroscopic qualities of the glands afford no certain guide as to their carcinomatous involvement. Therefore, all accessible glands should be extirpated.

Döderlein,² after unsatisfactory results with vaginal hysterectomy, was led to employ Wertheim's operation for carcinoma in all operable cases, whether of the corpus or of the cervix. He performed the operation in 26 cases out of 37 that came under his care, raising his percentage of operability from 45 to 70 per cent. His immediate mortality was 4; subsequent, 2. He believes this could be diminished by

¹ Erfahrungen über die abdominale Radikaloperation des Gebärmutterkrebsen; von der Versammlung Deutscher Naturforscher und Aerzte in Karlsbad. *Central. f. Gynäk.*, 1902, No. 43.

² Ueber abdominelle Extirpation des Carcinomatösen Uterus nach Wertheim. *Central. f. Gynäk.*, 1902, No. 26.

further improvement in the technique. In 18 of the cases enlarged glands were removed. In 7 of these they proved to be carcinomatous. He believes carcinomatous glands may be distinguished by their increased hardness. Glands cannot be removed by the vaginal method. Speculation as to the value of glandular extirpation is useless. One case of complete cure following Wertheim's method of operation, including removal of carcinomatous glands, would forever settle the question of the advisability of their removal.

Bullman¹ reports 14 cases of carcinoma of the uterus operated upon by Hofmeier. The abdominal operation of Freund or the modification of Rydygier was employed in all of the cases. The cases included: 7 carcinomata of the portio, with extension to the vaginal vault in 2 instances, to the parametrium 4 times, and to the bladder in 1 case; 4 cervical carcinomata, with invasion of the parametrium, 4 times, and of the vagina twice; 3 corpus carcinomata, with complications (adnexal disease). Two of the cases succumbed to the operation—a mortality of 14.28 per cent. Two were of too recent occurrence to be considered. Of the remaining 10, 5 are free from symptoms after one and three-quarter years to two and one-third years; the other 5 show a recurrence—50 per cent. Hofmeier's indications for the abdominal operation are:

1. Corpus carcinomata when there is disproportion between the size of the uterus and of the vagina, or if there are recognized or suspected metastases.

2. Carcinoma of the portio only if complicated by extension or otherwise.

3. In all cervix carcinomata not too extensively extended.

Schauta² believes that the essential point in the operative treatment of carcinoma of the cervix is the wide removal of the parametrium. According to him the so-called radical abdominal operation is not a radical procedure, for it is technically impossible to remove the entire lymphatic system of the pelvis. It may also, in a large number of cases, be unnecessary, as both the older investigations of Blau and Dybowski and the newer ones of Ruge and Veit and Wertheim and Freund seem to show. The analogy that is often drawn between carcinoma of the uterus and carcinoma of the breast and the necessity for the removal of the lymph glands in one as well as in the other is not justified. In the first there are a number of superficial glands lying close together that can be easily removed, whereas in the other the

¹ Ueber abdominelle Totalexstirpation bei Uteruscarcinom. Inaug. Dissert., Würzburg, 1901.

² Die operation des Gebärmutterkrebses mittels des Schuchardtschen Paravaginalschnittes. Monats. f. Geburts. und Gynäk., Band xv. p. 133.

glands are more or less inaccessible and attempts at their complete extirpation are fraught with danger. In its surgical treatment carcinoma of the uterus is much more like a similar affection of some of the other abdominal viscera. Schauta believes, therefore, that all that can be hoped for in a carcinoma operation is an extensive removal of the parametrium. This, he believes, is best done by vaginal hysterectomy, with the employment of Schuchardt's paravaginal incision. Using this method Schauta, among 64 cases, found 27 where he had reasonable hope of complete extirpation, an operability percentage of 42.2.

He reports in detail 30 operations. Among these there were five fatalities. Two of these resulted from ureteral injury in advanced cases where the ureters were involved in the carcinomatous area; another patient died of sepsis, another of pulmonary embolism, and a third from intestinal obstruction.

The author describes the technique of the operation, especially in those points wherein he differs from Schuchardt.

After circumcising the vaginal vault at a good distance from the carcinomatous growth he separates the mucosa toward the cervix and brings it together over the portio, so as to form a sort of fold, which covers in the carcinomatous area. The sutures used in doing this are left uncut and used as tractors. In separating the bladder from the cervix on either side will be found a point where the parametrium is adherent to the vesical wall. These are danger-points, for the bladder and the ureters, to whose openings they correspond, may be injured by a careless separation at these areas. Before extirpation of the parametrium the ureters are laid free and pushed to one side and kept constantly in view. The uterine artery is ligated early in the course of the operation. Schauta in all the steps of the operation ligates bleeding points as they occur. At the close of the operation the anterior and posterior vaginal walls are joined with the corresponding peritoneal surface and then the lines of junction anteriorly and posteriorly are brought together and drained.

Von Franque¹ regrets that more attention has not been given to the good results following vaginal amputation of the cervix in cases of carcinoma of the portio. He has seen cases of both Schroeder's and of Hofmeier's in which there was no return of the growth after six years. He has also examined uteri anatomically in which there was absolutely no extension of the disease beyond the lower cervix. The use of this operation in very early cases of portio carcinoma would reduce the imme-

¹ Zur chirurgischen Behandlung des Uteruskrebses. Central. f. Gynäk., 1902, No. 47.

diate mortality and be as efficacious as the more radical abdominal operation.

Staude¹ reports fifty-one cases of carcinoma treated by a modified form of Schuchardt's operation. In the first of these cases he employed the simple paravaginorectal incision of Schuchardt, which reached from the left of the portio above to almost the median line behind the anus. He found that such an incision did not give sufficient access to the parametrium. In a description of this procedure he takes for granted a case in which the restricted mobility of the uterus permits a drawing down of the portio for but 1 to 1.5 cm. An incision is first made on the left side from the junction of the upper with the lower two-thirds of the vagina, through the entire tissues from the vagina to the side of the rectum and to about the position of the anus. With the fingers the upper third of the vagina is separated from the bladder region in front and from the rectum behind. The original incision is now continued through this separated portion as far as the portio. Exactly the same procedure is carried out upon the opposite side. Finally, the two lateral incisions are united by cutting through the bridge of vaginal tissue anterior and posterior to the cervix. When the posterior vaginal incision and rectum are retracted by means of a speculum, the parametrial tissues are thoroughly exposed and rendered more accessible than through any other manœuvre. The analysis of Staude's cases will be worth recording. Of 51 cases, 47 were carcinomata of the cervix—the condition that we are most desirous of studying. Three of the operations were easy and the patients are all well, one after four and two after three years. In 19 of the cases the uterus was fairly movable—*i. e.*, the cervix could be drawn down to about the middle of the vagina. Of these, two died; one of heart failure, on the twelfth day from an undetermined cause. Seven of the series have suffered a recurrence. Five remain entirely well; one after three years, two after two years, one after one year, and one at the end of six months. The other cases have disappeared from observation.

The difficult cases numbered 25; of these, 7 died. From the remaining 18 there are 11 who have had recurrences. One case is well after five years; two cases after two years, and one after one year. The author realizes that these statistics are of no value as far as the actual cure of the patient is concerned, but asserts that in all of his other cases the recurrences occurred within three to six months of the operation. He seems especially pleased to have in the employment of this method raised his percentage of operable cases to 56.7—a slightly higher proportion than that given by Schuchardt himself.

¹ Ueber Totalexstirpation des carcinomatösen Uterus mittelst doppelseitiger Scheidenspaltung. Monats. f. Geburt. und Gynäk., Band xv. p. 863.

Before 1894 among forty-seven cases of cervical carcinoma the author, by the older method of vaginal hysterectomy, had considered but three operable. In two of his cases here reported the ureters were injured.

PALLIATIVE TREATMENT. Kroenig¹ says that the usual palliative treatment for carcinoma—curettage and cauterization—fails in many instances to relieve the hemorrhage and foul discharge. It is dangerous also in those cases where, from the extent of the affection, the use of the curette might inflict injury upon the bladder, rectum, or peritoneal cavity. In such cases the author recommends ligation of the internal iliac and the ovarian arteries. He has adopted this procedure in three cases of inoperable uterine carcinoma with most gratifying results. The slight operative interference is best conducted transperitoneally and disturbs the patient but very slightly. The woman may leave her bed on the eighth day.

The ligation of the internal iliac is best made at the point of its origin from the common iliac; the ovarian artery is occluded at its point of entrance into the broad ligament. Recently Kroenig has also ligated the round ligament so as to prevent the formation of a collateral circulation through the external iliac and spermatic arteries. The abdominal incision should be made very small. One may employ the transverse incision of the fascia after Pfannenstiel. The line of incision, however, must not be just above the symphysis, but should lie between the symphysis and the navel. In all three of Kroenig's cases the hemorrhage had been promptly checked. In one case (the first) it returned after three months, probably from collateral circulation. The discharge, although it at first subsides, returns relatively soon.

The author believes that in suitable cases, the ligation of these vessels should be combined with curettage and cauterization. He has refrained from combining the procedures in order to study the effects produced by ligation. He believes that in those cases of carcinoma which are found, after the abdomen is opened, to be inoperable, one should always, before closing the incision, ligate the vessels he has mentioned.

From this recommendation of Kroenig I am a dissenter, for in several cases which I have observed after being treated in this way the patients were not better, but in some instances the foul discharge was even greater. From these personal experiences I would advise against this procedure.

X-RAY THERAPY. Grubb² believes there is no doubt of the beneficent effects of the X-ray in the treatment of certain diseases,

¹ Die doppelseitige Unterbindung der Aa. hypogastrica und Ovarica zur palliativen Behandlung des Uteruscarcinom. *Central. f. Gynäk.*, 1902, No. 41.

² X-rays in the Treatment of Cancer and other Malignant Diseases. *Medical Record*, November 1, 1902.

which he would arrange in the order of their amenability to this treatment as follows: lupus, epithelioma, nodular recurrences (post-operative), primary carcinoma of breast, tuberculosis of lungs, tuberculosis of bones, cancer of soft internal organs, sarcomata, osteosarcomata.

Many theories have been advanced to explain the curative action of the X-ray. Some think that under its action cancer cells become transformed into normal tissue. Others, taking for granted the bacterial origin of these growths, believe the X-ray destroys these bacteria by its actinic power. Grubbé believes that, aside from whatever chemical or electric property the X-ray may possess, the sum-total of its action is that of an irritant. If we irritate a certain part of the body by making frequent X-ray exposures, we produce ultimately a simple focal inflammation. This means hyperæmia of the part. Leucocytes collect in large quantities at the area in question, stasis occurs, and the part, being cut off from circulating blood, dies from want of nourishment.

Grubbé says that the ray has a general stimulating effect upon the entire economy. He also submits the following conclusions:

1. In properly selected cases of so-called "incurable conditions" the X-ray has been curative.
2. Relief from pain is one of the most prominent features of the treatment.
3. The greatest value of the X-ray is in preventing post-operative recurrences.
4. The peculiarities of each case must be studied to determine the duration of exposure, vacuum of the tube, etc. No fixed rules can be laid down in this regard.
5. The ordinary photographic X-ray tube has such a changeable vacuum that they are unsuitable for radiotherapeutic work, and only tubes which allow of perfect control of vacuum should be used.
6. Even in hopeless cases the X-ray prolongs life and makes the last hours free from pain.

Caldwell¹ has invented a new variety of Crooke's tube, for use in the body cavities, in which the anode is grounded to prevent electrical shocks. These tubes are made with their anticathodes so placed that the main direction of the X-rays emitted is at an angle with the axis of the tube. This tube has been especially applicable for use in diseases of the cervix, and Caldwell has invented a new form especially for this work. It will be noted that in this tube, as in the old pear-shaped tube of Crooke, the cathode stream impinges not upon the metal target,

¹ A Special Type of Crooke's Tube for Therapeutic Applications of Röntgen Rays to the Cervix of the Uterus. *New York Medical Journal*, November, 1902.

but upon the glass wall of the bulb, which, therefore, becomes the source of the X-rays. There is also a considerable amount of heat developed at the point of contact with the cathode stream, and this tube is, therefore, furnished with a water-jacket to keep it cool. At the end of the water-jacket is a depression for the os uteri, which is intended to assist in keeping the tube in position. As indicated, the rays emanate from the end of this tube in every direction. If it is desired to limit the delivery of the rays to any part of the area on which this tube is used, the corresponding part of the tube should be covered with thick metal foil. It must not be forgotten that in such a tube the source of the X-rays is brought very close to the part under treatment, and the duration of exposure and the excitation of the tube must, therefore, be correspondingly decreased.

Cleaves¹ describes with minute detail the treatment of a case of inoperable cancer of the cervix with the X-ray and the ultra-violet rays. The patient, aged forty-two years, came under care May 14, 1901, in an enfeebled and cachectic condition. On examination the introitus was found partially occluded and the vagina filled with friable, carcinomatous masses reaching to the fornix; ulceration of the vaginal walls, infiltration of the broad ligaments, and a foul, sanguinolent discharge were present. As a last resort, the X-ray and the ultra-violet rays were employed. The X-ray was used intravaginally upon fifty occasions and there were an equal number of exposures to the ultra-violet rays. Tonics and general hygienic measures also were ordered. At the close of her treatment the patient felt perfectly well; she weighed eight pounds more than ever before. A local examination showed a "normal vulva and vagina. The cervix on the left side is continuous with the fornix. It is irregular in shape and longer on the right side. The entire cervix is covered with healthy mucous membrane, except that at the seat of the last X-ray exposure on the left side, where it is not yet healed. The broad ligament on the right side is free from infiltration. There is scar-tissue in the broad ligament of the left side dragging the fundus to the left. The uterus is normal in size, but is immovable. No enlarged glands can be made out, nor an infiltration in the pelvis. Neither ovaries nor tubes are palpable."

Dr. Coe reaffirmed all the statements made by Dr. Cleaves. The latter does not claim a complete cure of the patient, but wishes to draw attention to what may be accomplished in these apparently hopeless cases.

Pfahler² reports several new cases of carcinoma or sarcoma benefited

¹ The Treatment of Malignant Growths of the Uterus by the X-ray and the Ultra-violet Rays. Transactions of the New York Academy of Medicine, in American Gynecology, November, 1902.

² X-ray Therapy. Philadelphia Medical Journal, December, 1902.

or cured by the X-ray. We have not reached probably the limit of X-ray therapy, nor do we know the permanency of the results obtained. We are, however, justified in recommending its use in those cases unsuitable for operation. The question arises, then, Is the X-ray suitable for early cases of carcinoma? The method of treatment is still new, and, even in the hands of those most versed, it is difficult to judge the number of exposures, the duration of them, the distance the tube should be placed from the body, and the vacuum to employ.

Pennington¹ speaks of the difficulties of treating cancer of the rectum, etc., where such treatment may produce troublesome burns and the rays must pass through healthy tissues to reach them. Caldwell, in order to directly apply the ray to the diseased spot, invented a tube that might be introduced through the ordinary vaginal or rectal specula into the vagina or rectum. Pennington has devised a brass shield for this tube, which prevents action of the rays except through the speculum at one pole of the spherical shield. At the other pole is a handle by which to manipulate the instrument.

Johnson and Merrill² report a series of cases treated with the X-ray. Of sixteen cases of epithelioma, regardless of their length of existence, previous treatment, or extent of tissue involved, ten patients, or 62.5 per cent., were apparently cured.

Of seven carcinomata, all of which were classified as inoperable by the surgeons who referred the cases to the authors, none showed any improvement beyond relief from pain and probably a temporary delay in the fatal termination. They say that lupus vulgaris and epithelioma are much more amenable to X-ray therapy than are the deeper-seated carcinomata.

The authors usually see no effect upon the carcinomatous disease until a reaction of the tissues about the growth occurs. They therefore aim to use such a vacuum as will produce this reaction quickly.

Seabury Allen³ showed seven cases of malignant ulcerations of the face in which the use of the X-ray had been followed by improvement or cure. In four cases the diagnosis was verified by histological examination. The first, a woman with rodent ulcer of eight years' duration, had in all two hours and twenty minutes' exposure to the X-ray. The second, a man who had an epithelial cancer of twenty-five years' duration, involving the nose, cheek, forehead, and parts about the eye, was exposed to the X-ray in all for two hours and fifteen minutes. Another

¹ X-ray Tube-shields and Specula for Treating Cancer of the Rectum and Other Cavities. Philadelphia Medical Journal, December, 1902.

² The X-ray Treatment of Carcinoma. American Medicine, August 9, 1902.

³ Clinical Meeting of Staff, Massachusetts General Hospital. Boston Medical and Surgical Journal, October 16, 1902.

patient had a carcinoma of the tongue. After forty-five minutes' exposure the disease has not been affected in its area, but he has no pain and can speak and eat with greater freedom. The last case was one of sarcoma of the tonsil. The tumor showed externally and there was great difficulty in eating and talking. All symptoms disappeared after treatment.

THE URINARY SYSTEM IN WOMEN.

In the extensive literature which covers the anatomy, pathology, diagnosis, and treatment of diseases of the urinary system it is impossible to review all of the excellent papers. I have, therefore, selected a few which have especial bearing in gynecology.

Production of Pelvic Disease by Prolapsus of the Kidney. In the following paper I believe the author has pointed out some interesting facts, but I also think he is a little too zealous in attributing so much influence to a displaced kidney in retarding the ovarian circulation. Goelet¹ asserts that prolapse of the kidney may cause or maintain pelvic disturbances in the female by interfering with the return ovarian circulation. The prolapsed kidney may compress the ovarian vein in several ways. It may lie directly upon the vein and be pressed backward against it by corsets or tight clothing, or by accumulation of gas and fecal matter. The ureter also, in exaggerated cases, may be slung around the vein causing some obstruction, or the ureter may be dilated, if there is a tendency to hydronephrosis, and cause pressure in that way. If this cause for obstruction of the ovarian return circulation were constant, compensatory channels would be provided; but since it is not constant, and occurs during but a part of every twenty-four hours, the results are more pronounced and a marked congestion of the pelvic organs is produced.

Such a possibility has not been appreciated at the autopsy because here, unless the kidney be adherent, it has usually returned to its normal position.

The hepatic and intestinal disturbances associated with prolapse of the kidney also have a marked influence upon the production of pelvic congestion. Goelet attributes to this congestion various disorders of the pelvic viscera, as dysmenorrhœa, leucorrhœa, endometritis, salpingitis, uterine displacements, metrorrhagia and menorrhagia, hæmatoma, hæmatocele, and cystitis. All of these conditions Goelet has found associated with and apparently dependent upon the displaced kidney.

¹ The Influence of Prolapse of the Kidney on the Production of Disease of the Female Pelvic Organs. *Journal of the American Medical Association*, August 23, 1902.

He therefore urges that in all gynecological examinations attention be paid to the position of that organ.

Ureteral Surgery. Perlis¹ reports Döderlein as saying that the frequency of traumatism to the ureters is much greater than is apparent from the literature. In 2000 cœliotomies and 300 vaginal operations Martin wounded the ureter five times. Landau in 700 laparotomies met with no such accident, but in 489 vaginal operations he cut the ureter upon eight occasions. Segond observed three lesions of the ureter in 42 hysterectomies; Kaltenbach and Fehling, in 303 total vaginal extirpations, noted six injured ureters.

In repairing this surgical accident we may consider :

1. Uretero-ureteral anastomosis.
2. Uretero-vesical anastomosis.
3. Uretero-rectal or sigmoidal anastomosis.
4. Obliteration of the ureter by ligature.
5. Nephrectomy.

1. *Uretero-ureteral Anastomosis.* Of this may be mentioned several varieties :

- (a) Direct suture of the cross-cut ends.
- (b) Direct suture of the obliquely cut ends.
- (c) Invagination of the central into the peripheral portion.
- (d) Closure of the bladder portion and suture of the upper end into an opening made in the side of the former.
- (e) Closure of both portions and side-to-side anastomosis.

None of these methods are so good as implantation of the cut end of the ureter into the bladder ; but, of course, this is not always feasible. These operations may be employed even if the ureter has been damaged for an extent of 4 to 5 cm.; by loosening the attachments of the ureter the cut ends may be approximated. The danger in all forms is that of ureteral obliteration. This is especially true of the invagination operation. The sutures should be passed longitudinally through the ureteral wall, for these hold better than those passed transversely.

2. *Uretero-vesical Anastomosis.* There are three methods of transplanting the ureters into the bladder :

1. The purely intraperitoneal operation of Krause.
2. The partly intraperitoneal and partly extraperitoneal operation of Witzel.
3. The purely extraperitoneal operation of Mackenrodt.

Perlis considers Witzel's method the best and least dangerous. It consists in exposing the injured ureter by abdominal incision, and passing its end through a new opening in the peritoneum into the paravesical

¹ Zur Ureterenchirurgie. Monats. f. Geburts. und Gynäk., Band xv., Heft 3.

connective tissue. The peritoneum is then sewed over the exposed raw surfaces and the abdomen is closed. From the vaginal aspect the bladder is now loosened from its attachments, drawn over toward the ureteral end and anchored there with several sutures. The cut end of the ureter is afterward implanted into the bladder by the customary method.

3. *Uretero-rectal or Sigmoidal Anastomosis.* Up to the time of Tuffier and Madyl this procedure had almost invariably been followed by ascending ureteritis, pyelonephritis, and death. Tuffier and Maydl, believing that such a result was due to the lack of a protecting sphincter for the ureteral orifices, transplanted the entire trigonum into the bowel. The results were good.

Peterson, in 1900, collected thirty-six cases that had been operated upon by this method; 80.5 per cent. recovered. The operation is applicable, however, as a rule, only in cases of exstrophy of the bladder.

4. *Obliteration of the Ureter by Ligation.* This has been recently warmly recommended by Fenomenow. He carried it out in one case. The kidney underwent atrophy and the patient recovered. This atrophy resulted, he believed, not after hydronephrosis; he thinks that as soon as the pressure of the urine collecting in the kidney equalized the filtration pressure, the secretion ceased and the organ underwent atrophy. Fenomenow was not the first to suggest this method. Guyon already in 1892 had recommended it, and after him it had been used by Rüdiger, Bastionelli, Füh, Landau, and Muratow. The researches of Fraenkel in relation to this procedure upon animals showed that in every instance, after a well-placed ureteral ligature, hydronephrosis and hydroureter occurred. Furthermore, there was often urinary infiltration and, through this, perinephritic and periureteral abscess formations, which might easily impair the security of the ligature. Even in simple hydronephrosis the ureter sometimes opens. On this account Fraenkel believes that the ureter after it has been secured should be brought out through the abdominal incision. If leakage then occurs, no harm can result.

5. *Nephrectomy.* This is the most extreme procedure and must never be considered until attempts at transplantation have failed or are absolutely impossible. Before carrying out nephrectomy the condition of the opposite kidney should be thoroughly investigated. Cases are on record of nephrectomy when the removed organ was the only one the patient possessed, or where the opposite kidney was diseased and functionally insufficient. Karyanyi, in 1900, gave a method for testing rapidly the activity of the kidneys. It consists in determining the freezing-point of the blood. Normally this lies at 0.56° . When the kidneys are insufficient the amount of salt in the blood is increased

and the freezing-point of the blood sinks proportionately. This method, however, is valueless in determining the activity of a single organ. Such a determination is best made by ureteral catheterization and ureteral sounding. Achord and Delamarre have given a method in connection with this. It consists in the production of an artificial diabetes by the injection subcutaneously of 1 cm. of a 1 per cent. watery solution of phloridzin. The glycosuria induced in this way lasts about three hours. This glycosuria in a diseased kidney is more pronounced and of longer duration.

URETERAL FISTULÆ. Stoeckel¹ has written an exhaustive paper upon the subject of ureteral fistula.

Etiology. Gynecological operations play a more active part here than do the trauma incident to childbirth. Total extirpation for carcinoma of the cervix is most dangerous for the ureters. Henke found among 637 vaginal hysterectomies for carcinoma in Olshausen's clinic 14 cases of ureteral injury. In 9 of these the operation was undertaken for cervical carcinoma. Erlach and Wärz report four instances of ureteral injury among 131 vaginal extirpations for carcinoma.

The extensive radical abdominal operations for carcinoma undertaken by various German operators (Amann, Wertheim, Mackenrodt, Freund, Werth, von Rosthorn) has done much in the way of preventing accidental ureteral injuries, but it has also, by the extensiveness of the procedure, increased the risk to these structures. Whether these more radical measures are capable of better results will have to be determined later. There are many surgeons who oppose them, as, for instance, Jordan, who speaks of the operation as surgical sport. Even the advocates of the extensive carcinoma operation warn us against broadening the range of operability too far in these cases.

Freund had 3 cases of ureteral injury among 12 laparotomies; Wertheim met with 5 in 60 total extirpations, and 3 in a second series of 30 operations. Von Rosthorn had 2 cases among 32. Wertheim believed that the blood supply of the ureter played an important rôle in the occurrence of ureteral fistulæ subsequent to operation, and at his instigation Feitel made investigations upon this subject. He found that the under third of the ureter is supplied from the uterine and the vesical arteries; the middle third is supplied usually from a branch of the internal iliac, but may receive a branch directly from the aorta or from the common iliac. This latter vessel Feitel calls the *arteria ureterica*. In the carcinoma operation he advises one to carefully locate these vessels and to keep them and the ureters outside the field of danger. The ureters should be pushed to one side by blunt dissection. The line

¹ Weitere erfahrungen über Ureterfisteln und Ureterverletzungen. Archiv f. Gynäk., Band lxxvii., Heft 1.

of incision to divide the peritoneum over the ureters should be on their lateral side as far as the middle of the pars pelvina, where it should cross the ureter and be continued downward on its mesial side. Earlier observers (Waldeyer, Monari) have always insisted that the internal spermatic artery supplied the ureters. There appears at any rate to be a considerable variation in its blood supply. Whether the results are better if one follows Feitel's advice, Stoeckel thinks is questionable. He believes that in these cases the ureters are so weakened from inflammatory infiltration and marked periureteritis that in spite of uninjured blood supply fistulæ will ensue.

After these more extensive abdominal operations the ureters lie in relation to a large wound area and are exposed to the effect of the secretion from this area. It is a fact that these ureteral fistulæ result usually secondary to an operation rather than from direct injury at that time. The most important alteration in the ureter is a kinking, which may not be due to a direct action upon it, but to the traction exerted by a suture passed through neighboring tissues. There results a distention of the ureter above the point of obstruction; when the traction of the suture is relieved, either by its absorption or by granulation processes, the obstruction to the ureter is relieved and excretion of urine goes on actively. But the distended, thinned-out wall of the ureter has been exposed during this time to the discharge from granulating areas and undergoes suppuration and necrosis.

Prophylaxis. The newly recommended median division of the uterus as the initiatory step in abdominal and vaginal hysterectomy seems to prevent in a measure ureteral injuries. By dividing the organ in this way it is more easily handled and a direct injury to the neighboring structures is less likely to occur.

Older measures to prevent ureteral injuries are not in vogue. Ureteral catheterization is being used less and less. Recent investigations upon the relational anatomy of the ureters under normal and abnormal position of the uterus by Tandler and Halban should do much to prevent ureteral injury.

The prophylaxis of this subject does not end here. Even with the presence of a ureteral fistula we must prevent, if possible, infection of the bladder and kidneys. On this account, in such cases, the vagina should be cleansed twice daily with lysol, lysoform, sublimate, or other disinfectant. The operation for closure of the fistula should not be too long delayed. After six to eight weeks, if there is no disposition to spontaneous closure, even though all sutures have come away, it is useless to wait longer.

Diagnosis. Stoeckel places great reliance upon a cystoscopic examination for the diagnosis of ureteral injury. Although some authors have

criticised this procedure and found it unreliable, a report of their cases seems to show that the examination was either improperly conducted or incorrectly interpreted. If the ureter has been injured in such a way that its lumen is obstructed, the ureteral orifice in the bladder appears "dead." In case of doubt, ureteral catheterization may be further employed; but the latter procedure should be confined to the suspected ureter. The lowering of the freezing-point and the molecular concentration of the urine, as well as the phloridzin test of Casper and Richter, furnish sufficient evidence of the function of each kidney.

When one ureter has been completely divided, the urine that collects in the bladder may be taken as the product of the opposite kidney alone. When, however, the division of the ureter is not complete a certain amount of urine from this side will be found in the bladder. It is frequently impracticable to catheterize or probe the ureter from the site of the fistula. Contraction of the ureteral end occurs early, and attempts to introduce a sound are usually fruitless. Pressure upon the kidney of the affected side may reveal the ureteral orifice and discover the presence of hydro-ureter or hydronephrosis.

Treatment. Spontaneous healing probably only occurs in cases of partial lateral injury to the ureter.

Vaginal Operation. Plastic operations by way of the vagina have been employed by such men as Doyen, Dudley, and Leopold, but they are in general much less satisfactory and rational than the abdominal operations.

Technique of the abdominal operation of ureteral implantation into the bladder. The incision is made a little to that side of the median line which corresponds to the ureteral lesion; by making this 15 to 20 cm. (6-8 in.) in length, there is sufficient exposure of the injury. The incision of Mackenrodt along the border of the rectus and the bow-shaped incision (Israel, Ssokoloff) are unnecessary and predispose more or less to hernia. There are three portions of the ureter to be considered in the operation: the vesical portion, or that lying between the site of the fistula and the bladder; the fistulous portion, or that at the site of the fistula; and the renal portion. The latter is cut off above the site of the fistula and directly sutured into the bladder. The two other portions are disregarded in the operation, for they are usually embedded in scar-tissue, which quickly contracts as soon as the flow of urine is prevented. There is practically no danger, therefore, of a reflux from the bladder. The principles involved in this operation include such a disposition of the bladder and ureter that there will be little tension upon the sutures that bind the two together. No strain can be placed upon the ureteral sutures unless they are passed entirely through the ureteral wall, which procedure has manifest disadvantages. Stoeckel first

releases the bladder and draws it toward the affected side and holds it there by a few catgut sutures. The ureter likewise is drawn toward the bladder and fixed in its new position, so that not much traction is exerted upon it. The ureter is now drawn through an opening made in the bladder wall by means of a suture inserted through its cut end and passed out through the bladder and urethra. This is fixed so as not to draw on the ureter, but just "tight enough not to be loose." The ureter is now united to the bladder wall around the point of its entrance by a few catgut sutures. The dislocation of the bladder in these cases is usually but very slight, and causes no discomfort to the patient. One of the most important points in the operative cure is to insert a permanent catheter into the bladder until union has occurred. When the bladder is empty the ureter is most on the stretch, and when drainage is removed and the alternate distention and contraction of the viscus occurs, the empty organ does not produce increased tension on the ureter and thus endanger the union. Frequent catheterization cannot take the place of continuous drainage, for it is more apt to lead to irritation and inflammatory disturbance.

The extraperitoneal and intraperitoneal position of the point of implantation. There is a tendency among nearly all operators to cover the point of insertion of the ureter into the bladder with peritoneum. When the ureterovesical anastomosis remains uncovered, three dangers must be considered :

1. Necrosis of the ureteral wall where it is exposed, with formation of a fistula and discharge of urine into the peritoneal cavity.
2. Strangulation of the bowel by the string-like ureter lying free in the peritoneal cavity.
3. In case of failure of the sutures to hold, an infiltration of urine ending in death from general peritonitis.

Stoeckel, on the strength of ten cases operated upon by Fritsch and himself by the method previously described, believes that the dangers of the intraperitoneal operation have been exaggerated. The uncovering of the ureter is not such a serious matter. In all of Stoeckel's cases it was dissected out for a distance of 5 cm. (2 in.), and in one case for 8 cm. (3.2 in.), with no unfavorable results. Although it is partially stripped of peritoneum and passes isolated for a very short distance through the peritoneal cavity, its vitality is not impaired. In Fritsch's method the ureter is in relation with the lateral pelvic wall, except for the part directly implanted into the bladder, and this is almost entirely protected by the surrounding tissues.

The technique of the extraperitoneal method, as described by Gottschalk, so far as Stoeckel understands it, leaves the ureter in an unnatural position and curved concavely upward at its distal part. Because of

the good results following his intraperitoneal method, the author, in view of the difficulties and failures of both the other routes, would unhesitatingly cling to the intraperitoneal operation. Aside from the practical results from this form of operation *per se*, it affords a complete view of all the structures directly concerned and allows suitable operative treatment of any other conditions in the pelvis that need correction. Undoubtedly the important consideration in choosing the form of operation is the degree to which the function of the injured ureter has been restored. This may be determined by a subsequent operation or by a cystoscopic examination. The latter is the most practicable, and certainly affords a better criterion than any other method. Careful cystoscopic examinations subsequent to the operation also are important. On account of the social condition of the patient, or from her unwillingness to consent to such a procedure, they may be difficult to carry out in every instance. Such observations have not been made by the advocates of the extraperitoneal operation; but Stoeckel has in his cases, and assures us of the value of his operation. For some weeks after the operation, on account of the cedema, etc., of the implanted ureteral end, the urine is slowly passed into the bladder with a vermicular motion. After this swelling has disappeared, the urine is injected in spurts which are accompanied by a retraction of the ureteral orifice.

Ureterorrhaphy. This is by no means the operation of choice, but in some instances is sufficient and in others is necessary.

If the ureter has been partially injured a lateral simple suture may suffice to close the rent. If it has been entirely cut through and is too short to be implanted into the bladder, ureteral anastomosis must be undertaken. Implantation into the bladder may be performed even when the ureter is quite short, and Mackenrodt has accomplished this when the renal portion of the ureter measured scarcely half the ureteral length. Circular ureterorrhaphy is the preferable form of operation, as it is less apt to lead to constriction or to the formation of calculi. The sutures should not be too tightly tied and tension should be removed from the line of anastomosis by sutures passed above and below this point, which fix the ureters to their underlying connective tissue. This procedure also prevents kinking of the ureters—a complication that has often defeated the operation. The ureters, after the operation, should be buried beneath peritoneum and a suitable drain employed to guard against a failure of union.

It is regretable, but none the less true, that ureteral implantation and ureterorrhaphy are not always practicable. The fortunately rare cases in which a large portion of the ureter is resected are not amenable to either method. The question in such an event is, Can the patient be

cured and yet retain the kidney of the affected side? The anastomosis of the cut ureter into the healthy one must be looked upon as a hazardous experiment, and cannot be recommended.

An attempt to substitute a portion of resected intestine or to cover the defect in the ureter by a portion of the intestinal wall is successfully accomplished in animals, but in man it is not to be recommended. The substitution of the Fallopian tube for the defective portion of the ureter (d'Urso and Fabii), while possible from experiments upon animals, cannot seriously be considered in woman.

Implantation of the ureters into the bowel gives bad results. The Maydl operation, where the vesical trigone is implanted into the bowel, is not applicable to such cases as we are now discussing. While the intestinal mucosa seems to be sufficiently tolerant of the urine, an ascending ureteritis, ending in pyelonephritis and death, almost always results. The only course to pursue in such cases is one of the following.

1. Simple ligation of the ureter.
2. Formation of a fistula between the ureter and the abdominal wall, with secondary nephrectomy.
3. Immediate nephrectomy.

The Phloridzin Test. Watson and Bailey,¹ in view of the growing inadequacy of the ordinary analysis for estimating the sufficiency of the renal function, conducted experiments with the phloridzin test. Its technique is simple: A sterilized preparation of 5 mg. of the drug plus an equal quantity of Na_2CO_3 is injected subcutaneously. At the time of the injection the bladder is emptied and the urine secreted after that time is subjected to examination. The authors conclude:

1. That the average quantity of sugar eliminated in the first half-hour after the administration of the drug subcutaneously in the dose stated, if the kidneys are normal, is about 0.45 per cent.; the first half-hour's elimination is greater than the second half-hour's by 0.06 per cent.

2. When renal disease exists, the first half-hour's quantity of sugar eliminated is, for a series of cases, about one-half as much as when the kidneys are normal, and there is very little more in the first half-hour than in the second.

3. The effect of ether anæsthesia is to stimulate the kidneys to greater functional activity; but the renal function is not, if judged by the phloridzin test, in any way impaired by the anæsthesia.

This is true of the kidneys when normal only; when they are diseased, ether fails to stimulate their function, and there is, moreover, relatively

¹ Some Observations upon the Value of the Phloridzin Test for Estimating the Functional Capacity of the Kidneys; Renal Sufficiency. Boston Medical and Surgical Journal, December 4, 1902.

much less sugar eliminated in the first than in the second half-hour after phloridzin has been given than is the case when the kidneys are sound. If judged by the average results of a series of cases taken collectively, the phloridzin test gives accurate indications of the condition of the renal functions and of the existence of renal disease. "In a certain number of individual cases it even appears to be more delicate and discriminating than the ordinary urinary tests, but the relatively large number of instances in this series of investigations in which the reverse of this is true show it to be too variable to be trustworthy, or to incline us to urge its adoption in preference to the former methods of urinary analysis for estimating the functional capacity of the kidneys."

The Bladder after Hysteropexy. Kolischer¹ has observed functional and pathological changes in the bladder following the various operations undertaken for the correction of retrodisplacement of the uterus. The simplest of these operations—that of Alexander—does not seem to lead to any important changes in the condition of the bladder. There is no interference with its function, and its capacity, expelling force, and continence remain the same as before the operation. Neither bimanual nor cystoscopic examination with the viscus at different degrees of distention show any abnormalities, with this exception, that the bulging of the bladder wall corresponding to the fundus of the uterus is more pronounced. Ventrosuspension and fixation seem to have a decided influence in some cases upon the vesical function. When the bladder had previously been normal, patients complain of an increased frequency of urination and an increased susceptibility to infection, so that a slight "cold" will cause pronounced vesical disturbance. Cystoscopic examination in such instances shows a paleness and a thickening of the mucosa. If it is true that the desire for urination is caused by the stretching of the wall of the bladder, one can easily understand how this desire might be increased by a high suspension of the uterus. Vaginal fixation and vaginal shortening of the round ligaments must be considered, first, as to the interference with the bladder by the operative procedure; second, the conditions subsequent to operation resulting from alteration in the relations of the pelvic viscera.

The most dangerous part of the operation is the separation of the bladder from the cervix. The area of separation should be through the connective tissue between the bladder wall and uterus, and then no harm can result. If, however, the bladder wall is injured, there is apt to result a condition the author has already described as traumatic desquamative catarrh—an annoying affection, but one that usually heals entirely in the course of time.

¹ Condition of the Bladder after Hysteropexy. American Journal of Obstetrics, December, 1902.

The dislocation of the bladder causes no marked untoward effects. Its relationship to the uterus, of course, is changed, the fundus being in proximity to the trigonal area rather than to the vertex of the viscus. Some authors have claimed that the bladder may prolapse into Douglas' pouch, but Kolischer can find no creditable report of such an occurrence and knows of no case in his own experience.

The bladder usually takes a saddle-bag shape, being chiefly disposed on either side of the womb. After vaginal fixation in cases associated with cystocele, the bladder symptoms in several instances that came under Kolischer's care were greatly improved. This is, perhaps, in part due to the fact that the bladder raised above the uterus comes under the direct influence of the abdominal muscles, ensuring its complete evacuation.

Bullous Œdema of the Bladder. Lindenthal¹ calls attention to the well-known paper of Kolischer, who described an œdematous alteration of the bladder mucosa associated with those suppurative and other affections of the generative organs which produce circulatory disturbances in the vesical wall. This affection has been described as associated with pyosalpinx (Winter, Casper, Savor, Bierhoff); parametritis (Winter, Braun and Casper); carcinoma uteri (Winter, Casper, Bierhoff and Zangmeister); stump exudation after vaginal hysterectomy (Mirabeau); pyelitis (Borchert, Stoeckel); bladder tumors (Casper); chronic cystitis (Zangmeister and Bierhoff); acute cystitis; ureteritis with involvement of the vesical sphincter; ulceration after the use of the cautery, and cystocele (Bierhoff).

Such a list shows that bullous œdema of the bladder is not infrequent and that there is hardly a disease of the bladder or of the other pelvic organs in which it may not appear.

There has been an insufficient histological investigation in these cases, and there is no well-recognized anatomical picture of the affection. From the descriptions of some of the cases reported, Lindenthal believes the diagnosis to have been at fault, and he would reserve the term bullous œdema for an œdematous affection of the mucosa that is primary. Other authors—Störk, Zechmeister, and Matzenauer—have described cases where evidently papillary projections of the submucosa had, through pressure upon or twisting of their pedicles, become œdematous. This is more correctly described as cystitis colli proliferans œdematosa. Such an affection may present a cystoscopic picture very like bullous œdema. Other conditions may also be confused, and Mirabeau believes that the case of Stoeckel associated with tuberculous pyelitis was simply

¹ Ein Beiträge zur Kenntniss des bullosen Oedems der Harnblase. Monats. f. Geburts. und Gynäk., Band xv., Heft 4.

a prolapsus and œdematous swelling of the ureteral mucous membrane. Also, cystitis cystica must present a very similar cystoscopic picture to bullous œdema, and the small blebs sometimes seen normally in the bladder of women may be mistaken for this condition.

The term bullous œdema is a primary œdema of the mucosa due to chronic circulatory disturbances. The fluid collects in the loose submucosa, pushes the mucosa in front of it, and forms projections of the normal folds. Upon the summit of these folds one later sees pseudocystic formations which are not actually cysts, but are simply extremely œdematous projections of the stratum proprium covered by epithelium. It is hard to distinguish with the cystoscope this condition from a primary papilloma, but it is self-evident that the former will more readily return to the normal under appropriate treatment than the latter. Lindenthal reports what he believes to be the first case of œdema bullosum in which the diagnosis has been clinically substantiated.

His case occurred in a woman who had been afflicted with a cystocele for several years. A few days after he inserted a pessary the œdematous condition occurred, and was accompanied by pain. Upon removal of the hard-rubber ring the vesical mucosa returned to normal. Upon reinserting the pessary for a longer period, hemorrhagic and necrotic points occurred in addition to the œdema. Upon a final removal of the offending ring the œdema fully disappeared and the necrotic areas underwent cicatrization. The author believes that perhaps there was an especial predisposition to the affection in this woman; but he thinks it advisable to bear in mind bullous œdema when during the use of a pessary the patient presents urinary symptoms.

Granuloma of the Bladder. Kolischer¹ has observed a number of cases of vesical disease which he believes are of a type that is not clinically well known. Under certain favorable conditions tumors of granulation tissue occur in the female bladder. These tumors always arise in an area where some previous trauma has been sustained, and are the cause of disagreeable subjective and striking objective symptoms. In their relation to therapeutic measures they are rather resistant, and one is obliged to adopt radical means. The subjective manifestations are, increased micturition and a feeling of congestion in the bladder, which is increased in a warm bed—a peculiarity common to bladder tumors. Objectively we observe the occurrence of a tolerably copious and frequent bleeding and the discharge with the urine of phosphates. The latter comes from deposits which Kolischer has regularly observed upon these granulomata. The surface of this tumor appears raw, raspberry-like, and shows here and there little coagula and hemorrhagic areas.

¹ Granulome der weiblichen Blase. *Central. f. Gynäk.*, 1902, No. 10.

The summit of the growth is often the seat of a dendritic deposit of phosphates whose free ends, as fine, veil-like tissue, float in the bladder fluid. The contact of instruments with these granulomata produces hemorrhage. Occasionally during cystoscopic examination Kolischer believes he has observed spontaneous hemorrhage. It is to be remarked that although the tumor itself is insensitive the neighboring area of the vesical wall is very tender. Kolischer thinks it worthy of note that all of these cases which he has observed have been due to a crushing rather than to an incising trauma. The occasional infliction of injury upon the vesical mucosa in plastic operations upon the anterior vaginal wall, so far as he knows, and he has watched such cases carefully, has never given rise to lasting inconvenience. In the class of cases he has observed there has usually been an unhealthy condition of the bladder preceding the traumatism. The details of four cases are given :

Case I. Married woman, mother of three children. Since her last pregnancy she had complained more or less of vesical symptoms. Three months before Kolischer saw the patient she was confined. She required a high forceps operation ; and following labor there was bloody urine and the enforced use of the catheter during the entire puerperium. Four weeks after labor spontaneous evacuation of the bladder was possible and then the patient began to suffer with pain. The cystoscopic examination showed granulomata on either side of the trigonum at about the areas where the child's head had pushed the bladder wall against the pubes.

Case II. had suffered from vesical catarrh for a number of years, then she was fitted with a pessary. This, which perhaps fitted badly, in conjunction with the active use of a sewing machine, produced typical granulomata.

Case III. followed primary gonorrhœal urethritis, retention of urine, and the use of a catheter.

Case IV. showed previous vesical pain, difficult labor, craniotomy, and use of catheter from retention.

It will be seen that these cases resulted directly from either crushing trauma or through mild mechanical insults that were more or less continuous. In Kolischer's hands the palliative treatment alone was not sufficient for a cure. Attention must be directed to the general condition of the vesical mucosa, and the granulomata themselves must be curetted away. This can usually be done through the cystoscope and the employment of suprarenal extract, which is of great service in controlling hemorrhage.

Knee-Chest Posture in Vesical Operations. Kelly¹ calls attention to the advantages of the knee-chest position in the various operations

¹ The Advantages of the Knee-Chest Posture in Some Operations upon the Vesical End of the Ureters. *Journal of the American Medical Association*, August 9, 1902.

upon the bladder. The method consists in placing the patient in the knee-chest position and then letting air into the bladder through a catheter or a speculum. If the posterior vaginal wall is now lifted up so as to expose the entire vaginal wall from the cervix to the urethra a suitably curved knife may be plunged through the vesicovaginal septum into the air-distended bladder. An artificial anæmia of the bladder is induced by this posture, and whatever blood escapes from the cut runs down into the capacious reservoir and in no way obscures the field of operation. This simple procedure exposes the entire vesical field, and puts bladder surgery upon a new and convenient basis. Kelly reports successfully removing a large stone from the vesical extremity of the right ureter after exposing the field of operation by this method.

Vesical Calculus in Women. Graefe¹ gives as his experience that in cases of vesical calculus of large size in the female it is better to remove the stone through an anterior vaginal incision than by extraction through the urethra, by lithotripsy, or by suprapubic lithotomy. The danger of wounding the ureters, if the incision is made in the median line, is very small, and the closure of this incision is easily accomplished. Graefe also speaks of the advantages of Pezzer's self-retaining catheter in cases requiring drainage. It is easily introduced by means of a mandrin, and keeps its place without further trouble.

Methylene-blue in Genito-urinary Conditions. Graefe² also reports two cases of pyelitis—one associated with vesical stone, the other following puerperal sepsis—in which he employed methylene-blue with great success. He administered equal parts (0.1 gm.; 1 gr.) of methylene-blue (Merck) and powdered nutmeg twice daily in gelatin capsules. After five to six days' use it was discontinued until the color disappeared from the urine, when the use of the drug was resumed.

Von de Velde³ gives his experience with methylene-blue in relation to its effect upon mucous surfaces. It is a weak antiseptic, and, applied to the skin, causes no irritation. Mucous membranes, however, through a continuous contact with the drug in larger amount, are more or less irritated. The irritation of the drug upon the mucosa of the stomach may lead to vomiting. In several cases inflammatory alterations were found in the region of the greater curvature.

Diarrhœa in consequence of the administration of methylene-blue has been observed. As is well known, the substance is eliminated by the kidneys, for the most part unchanged. A review of the literature shows that symptoms of vesical irritation often follow its use. Of

¹ Ueber einen Fall von grossem Blasenstein nebst Bemerkung zur Behandlung der chronischer Pyelitis. *Central. f. Gynäk.*, 1902, No. 13.

² Ibid.

³ Behandlung der Cysto-pyelitis mit Methylenblau. *Central. f. Gynäk.*, 1892, No. 23.

all the mucous membranes that of the bladder is the most sensitive to this drug, and while symptoms of irritation have usually followed doses of 300 to 800 mg. to 1 g. and more, they have also resulted from much smaller doses.

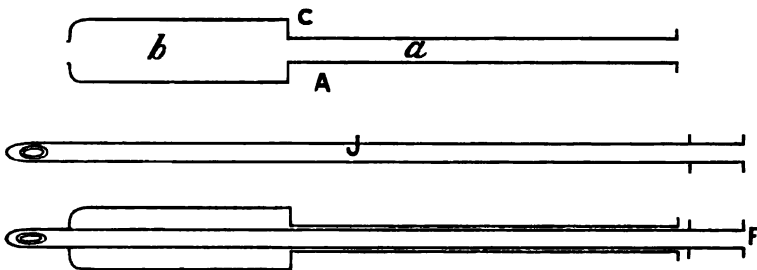
Experimentally Von de Velde injected into the bladders of some sixty persons 50 mg. of methylene-blue in a 5 per cent. solution. In a small proportion only of cases where the bladder mucosa was healthy did he see vesical irritation from this procedure. On the other hand, three of his patients, who at the time of the treatment had vesical catarrh, became worse. He has tried to eliminate all errors in judgment before making this assertion, but he can find no other reason for the exaggeration of symptoms in these cases.

He points out that the article of commerce sometimes contains a residue of chloride of zinc. This, of course, would decidedly increase the irritative properties of the drug.

The author speaks of the difference between Graefe's results and those of himself, and recommends further investigation along these lines.

A Double Catheter for the Prevention of Cystitis. Rosenstein¹ speaks of the annoying consequences that may follow postoperative catheterization. He then describes the usual method of passing the catheter, visually, and after cleansing the external meatus by means of some antiseptic solution; but he regards such cleansing even at best as faulty, and says that the outer two-thirds of the urethra have been shown to contain micro-organisms. He has invented an instrument which he

FIG. 43.



believes will prevent infection of the bladder and also all such traumatism to the bladder walls that may occur if the ordinary instrument is inserted too far. His catheter consists of two portions, an outer tube *A*, and an inner tube *J*. The outer tube is simply the guard of the inner, which is nothing but a straight catheter. The outer tube consists of two portions, the guiding shaft *a*, and the guard neck *b*. (Fig. 43.)

¹ Ein Doppelkatheter zur Verhütung der Cystitis bei Frauen. Central. f. Gynäk., 1902, No. 22.

This tube is introduced into the urethra as far as the collar *c*. The inner tube or catheter now passed through this does not come in contact with the meatus or outer two-thirds of the urethra, and by reason of the guard *F* at its extremity cannot be too far inserted into the bladder.

RETRODISPLACEMENTS OF THE UTERUS.

As usual, this year's PROGRESSIVE MEDICINE must give considerable attention to the operative treatment of retrodisplacements of the uterus. All of the various methods of treatment have been discussed in various places and in a varied spirit of approval and opposition.

Thus Robb, who has always been a consistent advocate of the suspension operation as performed by Kelly, again comes to the fore with a good paper advocating his belief in this operation. Cleveland, who, on the other hand, has been an unswerving champion of the Alexander-Adams operation, likewise discusses that method in a convincing way.

After all, there must be something of decided value in both of these operations, although one would be a little skeptical upon these questions if he were to pin his faith to Baldy, Riddle Goffe, and Goldsphon, all of whom present new operations.

Goldsphon's method of dealing with retrodisplacements does not strike me at all favorably. He practically does a double Bassini operation, exposing the patient to the dangers of a double coeliotomy to avoid, to my mind, the much less dangerous central incision.

As each writer ably presents his views, we will let them speak for themselves.

Choice of Treatment. Winternitz¹ divides cases of retroflexion and version as follows:

1. Retroflexio uteri mobilis in nullipara without complications. The complaints are mostly of a nervous nature, and the patient often becomes intensely introspective as to her pelvic organs, which tendency may be intensified by repeated vaginal examination or local treatment. One often finds in these cases the uterus quite small and unanswerable for the symptoms. The rectification of the position of the uterus can have but a psychical effect. In such cases local treatment is absolutely contra-indicated.

2. Retroflexion in women who have borne children without rupture of the perineum and who are neither nervous nor hysterical. Here the position must be corrected either by means of a pessary or by an operation.

¹ Die Wahl der Behandlungsmethode bei Retroflexio uteri mit besonderer Berücksichtigung der Subjektiven Beschwerden. Von der Versammlung Deutscher Naturforscher und Aerzte in Karlsbad. Central. f. Gynäk., 1902, No. 43.

3. Retroflexion with a torn perineum and descensus vaginæ. The patient complains of pressure and dragging sensation and loss of support. In such cases the descensus must be corrected with a pessary or by operation. The position of the uterus in such instances is not the source of the pain.

4. Retroflexion with complications, as endometritis, pelveoperitonitis, adnexal disease, uterine fixation. In these cases only operative treatment should be employed.

Surgical Treatment. Haggard¹ divides cases of retroversion into movable and adherent displacements. The former give rise to few or no symptoms *per se*; the latter are associated with tubal or ovarian disease and most of the symptoms are due to these lesions.

Theilhaber, of Munich; Winter, of Königsberg, and others believe that a simple uncomplicated retrodisplacement gives rise to no symptoms. Perhaps this is true at a given time; but Haggard likens our attitude toward an accidentally discovered displaced uterus with our attitude toward cardiac and renal disease, floating kidney, gallstones, and errors of refraction accidentally discovered. It does not follow that these conditions will remain quiescent. Winter, who followed ninety simple cases of retroversion for six months, found only six in which there was continuous absence of symptoms.

Von Rosthorn reports 1094 cases of retrodisplacement out of 6722 patients, or a percentage of 16.2 per cent. Of these 912 were movable, 192 adherent, 295 associated with prolapsus, and 21 occurred in the presence of general enteroptosis. Haggard found 17.8 per cent. of retrodisplacements among 1004 cases at the dispensary of the Woman's Hospital in New York. The author believes in the efficacy of the pessary when suitably fitted in nulliparous women or in others with a good pelvic floor.

Concerning the operative measures to be considered for retrodisplacement, Haggard says Alexander's operation has an important field in uncomplicated cases of retroversion in young, unmarried, or nulliparous women where the pessary is objectionable or has failed to cure. He gives five advantages for this operation:

1. It saves the embarrassment and discomfort of long, tedious, and oftentimes unprofitable local and mechanical treatment.
2. It does not interfere with subsequent pregnancy, the ligaments undergoing evolution and involution with the uterus.
3. It avoids opening the peritoneal cavity; such procedures ever have a slight but certain mortality.

¹ The Surgical Treatment of Retrodisplacements of the Uterus. American Gynecology, 1902, No. 3.

4. No adhesions are formed.

5. It is satisfactory from a curative standpoint in the great majority of cases.

The author believes ventrosuspension is the operation of choice when there is coincident adnexal disease, especially if the adnexal operation is to be a conservative one. Laphorn Smith reports 2500 cases of suspension of the uterus performed by forty gynecologists in which the results were most gratifying. Kelly reports 214 cases with 43 uncomplicated pregnancies.

The correction of cervical lesions and lacerations of the pelvic floor is often a most important requisite to success in the treatment of retrodisplacements.

Ultimate Results of the Various Operative Procedures. Andersch¹ reports 328 operations for retroversioflexion and prolapsus of the uterus, occurring in Pfannenstiel's clinic in Breslau.

The number of cases occurring during the same time in which the pessary was employed was 1496; so that it may be assumed, as Andersch himself claims, that the cases chosen for operation seemed amenable to no other form of treatment. The author wishes to avoid any discussion as to the indications for operation, and simply states that in Pfannenstiel's clinic cases of retroflexion without subjective symptoms are not treated. Furthermore, cases in which there are subjective symptoms that after some observation are believed to be independent of the version of the uterus are not treated by operative measures. Most of the cases of retroflexion, however, he believes require treatment either because they directly give rise to pain or because they are part of a general prolapse of the pelvic floor and uterus.

In Table I., Andersch includes 83 cases of more or less high grade descensus vaginæ in which anterior and posterior colporrhaphy was employed. He was able to examine subsequently 60 of these cases, and found entirely cured, 50; slight prolapse, 7; excessive prolapse, 3.

Of those patients from whom he received a report 42 were entirely free from subjective symptoms, 13 were still suffering, but only a few as severely as before operation. These examinations were made in 35 cases after the lapse of two years; in 13 during the second, and in 2 during the first year.

Tables II., III., and IV. include cases where the retroflexion of the uterus was the chief affection, but in which there was more or less descensus of the uterus and of the vagina.

Table II. includes 37 cases where vaginal shortening of the round ligament was combined with anterior and posterior colporrhaphy. Of

¹ Dauerfolge der operativen Retroflexio- und Prolapsebehandlung. Archiv f. Gynäk., Band lxx., Heft 2.

this series 29 were subsequently examined. Good results were found in 15; in 14 there had been a recurrence. These results were found in every case after two years, and in some of them after three years.

Table III. includes 73 cases operated upon by the older method of Dührssen (vaginofixation), with coincident anterior and posterior colporrhaphy. The results in this series are given both with respect to the position of the uterus and the recurrence of any prolapsus. Of 54 cases subsequently examined, 50 showed a good anteposition of the uterus; three times it was turned backward, and in 1 case completely prolapsed. With regard to the prolapsus, in 46 there was no return whatever; in 4 there was slight; in 3 more marked, and in 1 complete prolapsus of the vagina. Of these cases 17 were examined after four years; 19 after two years; 18 after one year, and 1 only during the first year.

Table IV. includes 44 cases of "seroso-serosen" fixation (after Dührssen's later method), plus anterior and posterior colporrhaphy. Thirty-two of these cases were subsequently examined. In 28 there was a good result; in the remainder there had been more or less return of the condition. The time that had elapsed since the operation varied from longer than one and one-half years in 14 and to less than a year in 6.

Table V. includes 63 cases of adherent retroflexioversio-uteri treated by ventrofixation. In 28 cases after freeing the adhesions the uterus was fixed. In 35 cases associated adnexal disease received attention. Of 50 cases subsequently examined all but 3 were cured. A description of the technique of the operation employed by Pfannenstiel is necessary to fully understand his published results. In the old Dührssen operation the anterior vaginal incision was simply used to allow access to the cellular tissue between the cervix and the vesical wall; the latter was pushed in front and the sutures passed through the cervix close up under the vesico-uterine fold of peritoneum, which remained intact.

In the later "seroso-serosen" operation the uterovesical peritoneum was incised in a longitudinal direction. The fixation sutures were then passed from one side to the other through the anterior border of the vaginal incision, peritoneum on one side, anterior face of uterus slightly below the round ligaments, peritoneum on opposite side and the corresponding vaginal parts. Before these sutures were tied (two were usually employed, of silkworm-gut) the incision through the peritoneum was closed with running catgut. Pfannenstiel's ventrofixation consists in passing silkworm-gut sutures through the uterus and the entire layer of the abdominal wall. They are removed at the end of several weeks. It will be observed that the older method of Dührssen fixes the uterus more artificially, and was, therefore, employed only in women past the

menopause or in those in whom for some reason subsequent pregnancies need not be considered.

As will be seen in the other form of operation that leads to the formation of a new uterovesical fold of peritoneum that is sufficient to hold the organ in place, the uterus is not fixed, but lightly attached to the vesical peritoneum. A moment's thought shows that Pfannenstiel's ventrofixation is not a fixation at all in the sense of the American use of the word, for as soon as the silkworm-gut sutures are removed the uterus is united to nothing but peritoneum, just as in our own ventrosuspension. The results of these operations with regard to pregnancy Andersch does not discuss except as regards the "seroso-serosen" vaginal fixation. Twenty cases of this sort have been reported by Dührssen; subsequently there were eighteen normal labors; in 2 artificial assistance was necessary. The operation when properly executed simply forms a new suspensory ligament and seems to interfere in no way with pregnancy. The other operations that have been suggested for prolapse, etc.—Bellini-Freund's vagino-suture, total vaginal extirpation, and the Freund-Wertheim-Fritsch operation—Andersch has not looked upon with favor.

Andersch concludes as follows:

1. All movable retroflexions, with or without prolapse or descensus, as far as possible should be treated by means of the pessary.
2. Movable retroflexions with prolapsus or descensus, or the latter without retroflexion of the uterus (the pessary being unsatisfactory), should be treated by vaginofixation, with or without, according to the age of the patient, isolated closure of the peritoneum.
3. The infrequent cases of simple retroflexion that are not amenable to the pessary should be subjected to the Alexander-Adams operation or ventrofixation.
4. All cases of adherent retroflexion must be treated by ventrofixation.

Ventrosuspension. Robb¹ thinks that fixation of the uterus to the abdominal wall is always objectionable. He classifies the cases suitable for ventrosuspension into three categories:

1. Uncomplicated but obstinate malposition, which in itself produces certain untoward symptoms.
2. Malposition plus adhesions or other pathological conditions.
3. Adhesions or other pathological lesions demanding operation with malposition of the uterus as an associated condition.

Advantages from the operation of ventrosuspension may be direct or indirect. In many cases where manual or instrumental reposition has failed to give any permanent relief as soon as the uterus is permanently

¹ The Advantages, Disadvantages, and Results of Suspension of the Uterus. *American Gynecology*, August, 1902.

maintained in a normal position there will be a cessation of pain and obstinate constipation. Very often associated conditions, as, for instance, adhesions, old inflammatory foci, or a diseased appendix, may be coincidentally removed, thus ensuring the patient against serious illness in the future. When the proper technique has been employed in the operation the uterus lies in such a position that the abdominal pressure tends continually to improve the condition.

There are some disadvantages in this operation, and Robb has set them down under five headings :

1. Ventrosuspension, though successful, may not give relief; here the case has not been happily chosen.

2. The artificially formed ligament may not hold and the malposition may recur. There is little danger of this, however, if the abdominal pressure is utilized by suspending the uterus in an exaggerated position of antelexion.

3. Hernia of the abdominal incision. This is quite unusual if care is taken in the approximation of the fascia.

4. General sepsis and visceral adhesions have occurred after this operation, but they are not due to the procedure *per se*. They must always remain possibilities after every form of intra-abdominal operation.

5. Complications during pregnancy have been reported subsequent to suspension of the uterus, but Robb believes that these so-called "suspensions" have really been fixations. From his own observations on about 200 cases Robb considers ventrosuspension the most satisfactory operative treatment of retrodisplacements of the uterus.

Dangers of Ventrofixation and Ventrosuspension. Kreutzman¹ discusses the question of operative treatment of retroversion of the uterus, especially with reference to the operations of ventrosuspension and ventrofixation.

He believes, first of all, that a healthy retroverted uterus does not in itself require treatment, and is of no significance whatever as a factor in the production of illness. He says he lays stress, in this assertion, upon the words "healthy uterus" because no doubt slight inflammatory affections of the pelvic peritoneum or of the parametrium and diseases of the uterus or of its adnexa coexisting with a retroflexion are often overlooked.

Kreutzman has become convinced of the insignificance of a simple uncomplicated retroverted uterus by the observance of a number of patients exhibiting this condition for a period of many years, in which absence of all disease manifestations and pregnancy have been common.

¹ Are Ventrofixation and Ventrosuspension of the Uterus Justifiable Operations? *American Medicine*, October, 1902.

The dissensions of physicians upon this point the author believes due to two causes :

1. Lack of relation between an anatomical cure and the restoration to health in cases of retroversion.

2. The influence ascribed to psychical impression.

It is well known that a woman who suffers from symptoms attributed to a retroversion of her uterus may become cured without the least change in the position of her uterus. On the contrary, she may have the position of her uterus restored without any amelioration in her symptoms. The psychical effect of treatment plays an important rôle ; this is true in women as a class, and especially in those cases whose attention has been called to their genitalia. Kreutzman, however, believes that in the presence of symptoms a retroverted uterus should always be replaced, even though the condition does not seem dependent upon the malposition.

With regard to the methods of treatment massage often seems to do good by causing the disappearance of old exudates and restoration to the normal tone of the ligaments. The pessary is chiefly valuable in post-partum retroversion, and aside from such cases it is almost useless so far as permanent relief is concerned. "A permanent restoration of a retroflexed uterus to normal position can be guaranteed only by operation."

The operations of ventrosuspension and ventrofixation of the uterus are unjustifiable. True, they do eradicate the retroflexion, but in its place they make of the uterus, normally a pelvic organ, a partially abdominal one. The uterus, also a naturally freely movable organ, becomes more or less fixed by these unnatural ligaments, and, furthermore, a status is created that does not exist under normal conditions, viz., a bridge of tissue is formed between an abdominal organ and the belly wall. Every woman with such a pseudoligament is in danger of death from intestinal obstruction. In a hasty survey of the literature, Kreutzman found such cases reported by Jacobs, Olshausen, D. H. Williams, Hall, Thomas, and Lindtars. He is of the opinion that many such cases remain unreported. He also believes that no matter how large a number of patients have subsequently passed through an uneventful period of gestation every woman the subject of this operation is exposed to some grave disturbance during the progress of labor. The dangers from this operation, together with the fact that it is not an indispensable procedure, should render it obsolete. Alexander's operation answers every indication in cases of uncomplicated retroversion. The sense of palpation should be so developed by the gynecologist that he is able to say beforehand whether in a given case there are adhesions of the uterus or pathological conditions of the adnexa.

In such an event the operation of choice would be anterior or posterior colpotomy with operative correction of the intrapelvic conditions followed

by vaginal shortening of the round ligaments or by Alexander's operation. I cannot pass over this paper without strong dissent. Certainly, from the large series of successful cases of ventrosuspension reported, Kreutzman's unqualified condemnation is entirely unjustifiable. Such poorly judged views can only come from a seriously biased observer of the literature.

Intra-abdominal Shortening of the Round Ligaments per Vaginam. Goffe¹ believes that the ligaments of the uterus were intended for its support just as are the ligaments of other abdominal organs. The most important ligament is the uterosacral, which pulls the cervix backward and throws the fundus forward. This action is supplanted by the uterovesical ligaments and by the cellular tissue at the bases of the broad ligaments. Goffe believes that any operative procedure for the cure of retrodisplacement depends for its efficiency upon the fact that it enables the uterosacral ligaments to involute and recover their sustaining power. This result may also be secured from operative procedures directly applied to these ligaments themselves. The next most favorable suspensory media are the round ligaments. Alexander and others have demonstrated that the shortening of these ligaments at the external abdominal ring is an efficient method of supporting the uterus in cases not complicated by adhesions or inflammatory processes.

During the past six years Goffe has shortened the round ligaments through an incision into the anterior fornix of the vagina in 130 cases. Ten of the women subsequently became pregnant, and in 8 the pregnancy went to term, and the uterus remained in good position thereafter. One of the miscarriages was in a syphilitic negress. The author believes this mode of operation to be the best, first, because of the general superiority of the vaginal over the abdominal route, and because not only in uncomplicated cases can the position of the uterus be corrected, but associated affections of the adnexa are open to appropriate operative treatment. The operation seems especially good in cases of congenital retroversion. Here the uterosacral ligaments are lax, while the uterovesical ones are shorter and the anterior vaginal wall is attached low down on the face of the cervix. The vaginal operation divides the uterovesical ligaments, and after the round ligaments have been shortened the anterior vaginal wall should be attached to the cervix at a higher point. Goffe in this manner has had most successful results with these difficult cases.

Baldy's Operation. J. M. Baldy² says that Alexander's operation is a thing of the past except in the hands of a few. Hysterorrhaphy, ventro-

¹ Intra-abdominal Shortening of the Round Ligaments per Vaginam for the Cure of Retrodisplacements of the Uterus. *American Gynecology*, October, 1902.

² *American Journal of Obstetrics*, May, 1902.

suspension, and similar operations have been more or less unsatisfactory, as is shown by the large number of attempts to devise new surgical procedures for the same end. The round ligaments have been the structures involved in most of these operations. They have been doubled upon themselves and secured in this position. They have been attached to one another and to the uterus anteriorly; they have been sutured into openings made in the anterior face of the uterus; they are sometimes shortened by excising a portion of them and reuniting the cut ends.

Other operative measures have been shortening of the uterosacral ligaments, either by doubling them on themselves or by excising a portion, and vaginal fixation in which the uterus is freed from the bladder and united to the anterior wall of the vagina. Baldy has tried all of them, and likes best the one proposed by Webster, who draws the round ligaments through perforations in the broad ligament and unites them posteriorly and to the uterus. Such an operation tilts the uterus forward beyond the axis of the pelvis and any increase of intra-abdominal pressure drives the uterus forward toward the bladder and not to the hollow of the sacrum. The round ligaments form a perfect sling back of the uterus to which they are sutured or not as the operator chooses.

The disadvantages of the procedure are that at the completion of the operation the ligaments are attached under considerable tension and there is danger of their pulling away from one another. Again, in a future pregnancy one could not say whether the round ligaments would not tear away from one another, or, if they did not, how far they would interfere with the normal progress of gestation. Baldy, after much thinking and experimenting, has devised an improvement over this operation which retains all of its advantages and does away with all of its objectionable features. He cuts the round ligament close to the uterus and after controlling hemorrhage draws the free cut end of the ligament through a perforation in the broad ligament and sutures it to the posterior aspect of the uterine cornu. A portion of the ligament may be excised if it is necessary to secure good position. The uterus remains a pelvic organ; it has no artificial supports; it is as free to expand during pregnancy as before, and there are no adhesions to give pain or possibly strangulation of the gut. The tops of the broad ligaments are twisted forward, not enough to endanger the Fallopian tubes by strangulation, but sufficiently so, if desired, to draw up and suspend the ovaries.

There are some apparent advantages to be gained by Baldy's operation, and yet it seems, in view of the complete division of the round ligament, surgically irrational.

Bi-inguinal Coeliotomy. Goldspohn¹ reports 105 cases of bi-inguinal coeliotomy. He says the crucial test of the value of any method of operative treatment for correction in retroversion is after a subsequent pregnancy. The operation of shortening the round ligaments in the inguinal canal has in his view no real competitor, ten operators alone having 80 cases which have stood the test. The round ligaments render the required service because they are naturally connected with the development, etc., of the uterine musculature. While during pregnancy artificial ligaments may stretch, after labor they do not undergo involution as do the round ligaments, but remain loose bands which sometimes, as has occurred in 15 cases, have produced obstruction of the bowels. It is in the inguinal canal that the round ligaments are best shortened, for it is here that they are the most weak and less developed, and by drawing the stronger portion of the ligament into the inguinal canal and suturing it there one acts much more rationally than when it is doubled upon itself or a portion of the well-developed areas is excised. In order to make this form of operation applicable to those cases of retroversion complicated by adhesions or adnexal disease, Goldspohn opens the peritoneum at the internal ring and gains access to the pelvic organs in this way. The tube and ovary of the corresponding side are easily drawn into the incision and necessary operative measures are easily carried out. Finally, the round ligaments are drawn taut, and the inguinal canal is closed as in a Bassini hernia operation.

Alexander's Operation. Clement Cleveland² believes every woman should have treatment when she has a misplaced uterus. Experience has taught Cleveland the efficiency of the Alexander operation in properly selected cases. He is, however, far more conservative in his selection than formerly. In the first place the organ should be freely movable and capable of being maintained in its position by a pessary. If, after being replaced, it at once returns to a malposition, there is evidence that adhesions exist. When the latter are suspected or known to exist, the Alexander operation is not applicable, and one of the abdominal or vaginal methods should be chosen. A person with some constitutional dyscrasia must never be subjected to the Alexander operation. The same is to a lesser degree true of patients with prolapsus of the uterus or those in whom the uterus is the seat of a fibroid, for here the operation in question is not satisfactory. Before employing the Alexander operation in every instance Cleveland satisfies himself that a pessary will support the uterus with entire comfort to the patient. For two months following the operation also the pessary should be worn; it is

¹ A Résumé of the Rationale and Technique of Bi-inguinal Coeliotomy for Complicated Aseptic Retroversions of the Uterus. *American Journal of Obstetrics*, November, 1902.

² The Alexander Operation. *American Gynecology*, July, 1902.

quite essential to the success of the operation ; dragging upon the sutures and upon the new attachments of the round ligament in the inguinal canal is prevented and the pain and discomfort always complained of in the absence of this support are avoided. Cleveland has seen many cases of cure of retrodisplacement by the use of the pessary alone, "and is thereby convinced of its great ability as an aid in the recuperation of the peritoneal supports." In describing the technique of the operation Cleveland lays stress upon being able to cut down immediately on the external abdominal ring. Many operators mistake the superficial fascia for the intercolumnar fascia, and this leads to much confusion. The field of operation must be kept bloodless and retraction is better made by sutures or by forceps than by retractors themselves.

The genital branch of the genitocrural nerve accompanies the ligament and must be isolated and held to one side ; the ligament cannot be pulled out if attached to this nerve, and if the latter is cut or included in the sutures the patient complains of anæsthesia or pain for months afterward.

The infundibuliform process of the peritoneum, which is brought into view when pulling out the ligament, should not be stripped back. It should, on the contrary, be included in the first suture, for this procedure helps not only to strengthen the attachments of the ligament, but also adds to the support of the uterus by taking up a fold of the peritoneum. About four inches of the ligament should be drawn out upon both sides. Before the fixation sutures are introduced, an assistant should make a bimanual examination, in order to determine whether the uterus is in its proper place. With regard to the landmarks of this operation, the pubic spine and the external abdominal ring, Cleveland says that the pubic spine is sometimes indistinct or almost wanting, so that it may be necessary to begin the incision from the pubis at a point where the spine should be located, and to trust to the sense of touch to locate the external ring after the incision is made. The external ring itself varies greatly in size—from a large open space to a very small one close to the pubic bone. Occasionally a large, thick pouch of peritoneum appears with the ligament, as the latter is drawn out. This is the "canal of Nuck," a portion of the peritoneum analogous to the tunica vaginalis of the male. When such an event occurs the operation should be abandoned. Cleveland has never found any bad effects upon the pregnant uterus following this operation. He has never heard of an abortion resulting from it as a cause. He says : " I have several times opened the abdomen to break up adhesions about a retrodisplaced uterus and have then shortened the round ligaments by the Alexander method before closing the abdominal wound. I have thus been enabled to study the effects of drawing upon the round ligaments.

" When both ligaments were drawn up, making them equally very

taut, the uterus and its supports would seem held too tensely; by allowing the ligaments to slip back a very little all the desired mobility of a normally poised uterus is given to the organ. I was enabled to demonstrate to my entire satisfaction that it is impossible to anteflex the uterus, as has been claimed, by drawing upon the round ligaments, no matter how tensely.

"If a retroflexed uterus is not replaced and held in position by a pessary before shortening the round ligaments there is danger, by drawing upon these ligaments, of exaggerating the retroflexion. I have a number of times demonstrated this fact."

After the Alexander operation the patient should be confined to bed for three weeks.

INFLAMMATORY AFFECTIONS OF THE PELVIC VISCERA.

Polano describes his apparatus and method of treatment of pelvic inflammatory lesions. It is the hot-air therapy of joints, etc., applied to the pelvis. He also gives his experience as to the value of the leucocyte count in pelvic inflammation. Laubenberg considers the qualitative blood changes under similar conditions. Jung gives interesting observations in the bacteriology of pelvic suppuration, and Schatz and von Rosthorn explain his unusual findings, drawing our attention to a heretofore not commonly remarked mode of infection. Eisenberg shows how good results may follow an intelligent use of the vaginal douche.

Hot-air Treatment of Chronic Pelvic Inflammation. Polano,¹ impressed with the results of hot-air therapy in the treatment of chronic articular affections, decided to employ the same principles in a certain line of gynecological cases.

Chronic exudative processes are most fitted for this treatment; a fresh acute process contraindicates its use. In the presence of chronic inflammatory exudate with pus formation the latter is to be evacuated before this method is employed. Polano reports by the use of hot-air the most gratifying results in the treatment of chronic inflammatory cases, not only in the objective, but also in the subjective manifestations. Pain is almost immediately controlled, and the woman who at first looked askance at the procedure soon becomes its advocate.

The apparatus consists of a box, which is so constructed that it encloses the body of the patient, lying supine, from the epigastrium to above the knees. The chamber is heated by means of a Bunsen burner. Upon the first day of application the patient is exposed to a temperature of

¹ Eine Neue Methode der Behandlung chronischer Beckenexsudate. *Central. f. Gynäk.*, 1901, No. 30.

120° F. for twenty minutes. The degree and duration are gradually increased daily, so that by the eighth day the average woman will be taking 135° to 150° F. for a period of forty-five minutes. To directly influence parametrial exudates Polano employs a cylindrical speculum of hard rubber, through which he conducts hot air directly to the vault of the vagina.

While taking this pelvic hot-air bath the woman will complain of a prickling sensation on the cutaneous surfaces, which are covered with a profuse perspiration, and show pronounced hyperæmia. At the close of the treatment the heat is gradually reduced during a period of five minutes. After thorough drying of the skin the parts are covered with cotton, and the patient directed to remain thus protected for an hour in bed.

Treatment of Pelvic Exudates; Leucocytosis a Diagnostic Factor. Dützman¹ gives his results in the treatment of pelvic suppurative conditions by means of hot air, and his further investigations with the estimation of the leucocytes as an aid to diagnosis.

The employment of hot air was suggested by the excellent results following its use in chronic articular diseases. An apparatus described by Polano and invented by Klapp with suitable modifications is in every way satisfactory.

Dützman divides the cases amenable to this sort of treatment into two classes: 1. Fresh suppurative exudates. 2. Remains of old exudates. The first produces pain through the acute inflammation; the second because of adhesions and scar tissue. One is benefited by softening the tissue and evacuation of pus; the other by absorption of the chronic inflammatory tissue.

How hot air may affect such extreme types equally well Dützman attempts to explain. In response to the usually employed temperature of 150° F. there is considerable reaction; the body endeavors to equalize heat production and heat elimination. The heart's action is increased to about 150 beats per minute. A larger amount of blood is in a shorter time driven through the bloodvessels; the skin, so widely as it is acted upon by the heat, and that in Dützman's method is from the epigastrium to the knees, takes on a dark red, in part speckled appearance, and perspiration flows from it in a stream, all signs that the heat has caused an active hyperæmia. Through this and the resulting active metabolic changes the beneficent effect upon the disease is produced. That the heat affects the internal parts also is shown beyond question by an increase in the rectal temperature.

¹ Diagnose und Behandlung der Exsudate. *Monats. f. Geburts und Gynäk.*, Band xvi., Heft 1.

After three or four treatments, fresh hard exudates soften and allow the evacuation of pus, while old cicatrices and adhesions are markedly softer. One other factor should not be forgotten. After using the hot air the patient is given a cold shower bath. This improves the general metabolism and may have some influence upon the local disorder. Dützman has treated twenty cases in this way with most excellent results.

With respect to the value of the leucocyte estimation in pelvic inflammatory diseases, the author has 125 cases to add to those already reported, making in all 165 cases.

He found the test absolutely reliable, pus being invariably found in case the number of leucocytes was increased, and no pus being discovered when the leucocyte count was normal. He found the degree of leucocytosis depended in part upon the virulence of the infecting organism. Thus, with streptococci present the leucocytes numbered 20,000 to 30,000, with gonococci or colon bacilli 11,000 to 13,000. In peritonitis and sepsis the leucocyte estimation is of prognostic value; a high count shows the favorable reaction of the economy and the probable destruction of the germs and their toxins. A normal count, on the other hand, shows a failure of reaction and augurs badly for the patient.

QUALITATIVE BLOOD CHANGES IN SUPPURATIVE PARAMETRITIS. Laubenberg¹ has investigated the qualitative blood changes in those cases of "chloro-anæmia" associated with suppurative parametritis following childbirth.

He gives in detail several of his cases, and says that the alterations in the blood are proportionate to the duration and intensity of the suppurating process. His observations bear out those of Dützman with regard to the value of leucocytosis as an aid in the diagnosis of these suppurative conditions. Suppurative processes in the genital region cause a diminution in the red blood cells and an increase in the white blood cells. Upon the cessation of the process the blood returns to its normal condition. The more abrupt the infectious process the quicker the reaction of the blood, and the speedier its return to normal after the supuration has ceased. In long-drawn-out cases the blood reacts less promptly, but may also give signs of its impoverishment for a considerable time after the ordinary clinical symptoms have disappeared. The leucocytosis affects principally the polymorphonuclears. Eosinophiles appeared to be somewhat diminished. Laubenberg never observed nucleated reds, alterations in the size and form of the reds, nor any abnormal elements. The gross appearance of such blood corresponded to that of the usual secondary anæmias.

¹ Ueber Wesen und Bedeutung der veränderten Blutbeschaffenheit bei Eitrigen Processes im Genitalapparat der Frau. *Central. f. Gynäk.*, 1902, No. 22.

Hot-water Treatment of Pelvic Exudates. Eisenberg¹ has investigated for some time the action of hot water upon chronic inflammatory pelvic conditions. He uses hot vaginal douches of from 30 to 40 litres of hot water and has had excellent results.

1. In large extraperitoneal or intraperitoneal exudates whether of genital origin or not (excluding acute pyrexia conditions where leucocytosis is present); in post-puerperal affections; also, in the exudates following appendicitis.

2. In chronic adnexal disease. An exact diagnosis and considerable experience are necessary here.

The method is contraindicated in case of pyosalpinx. In salpingo-oöphoritis the procedure is far ahead of the ichthyol treatment on account of its beneficent effect upon the subjective symptoms.

The favored employment of the hot-water treatment is in chronic adhesive perimetritis and obsolete parametritis with the formation of scar-tissue and fixation of the organs. Here, besides ameliorating the suffering, the treatment causes a marked resorption; it may well be combined with massage. It possesses advantages over the other conservative measures in that the douche apparatus, etc., may be carried from place to place.

Bacteriology of Pelvic Suppuration. Jung² reports 122 cases of pelvic suppuration in the Greifswald Clinic in which the mortality was 18 per cent. The deaths occurred chiefly after laparotomy, which was the operation of choice in the severest cases. The unfavorable results were to be attributed to the high grade of virulence of the pus. In 78 observations only fourteen times was the pus sterile, twenty-six times streptococci, twelve times gonococci, six times colon bacilli, thirteen times tubercle bacilli, and once ray fungi were found.

In the Greifswald Clinic vaginal drainage is used for those cases of pelvic abscess which point into the vagina. When the diseased adnexa are easily accessible from the vagina and somewhat movable, if a radical operation is to be performed, colpotomy is chosen. All other cases are subjected to coeliotomy.

Jung believes, contrary to the usual opinion, that puerperal septic processes more often affect the adnexa than the parametrium. He has found the estimation of the leucocytes of decided value in the diagnosis of pelvic suppuration. He calls particular attention to the frequency of

¹ Zur Konservativen Behandlung der chronischen Entzündungen der weiblichen Beckenorgane, von der Versammlung Deutscher Naturforscher und Aerzte in Karlsbad. Central. f. Gynäk., 1902, No. 43.

² Zur Behandlung eitriger Affektionen der Adnexe und der Beckenbindegewebe, von der Versammlung Deutscher Naturforscher und Aerzte in Karlsbad. Central f. Gynäk., 1902, No. 43.

streptococci in his cases as compared with statistics compiled in large cities, where the frequency of the gonococcus is very much greater.

Schatz, in the discussion of Jung's paper, said that he had observed the same proportion between streptococcal and gonococcal infections in his neighborhood. He finds that this is uniformly true in areas along the edge of water, and explains it by the frequency of streptococcal sore-throat in these regions. The organisms remain in the throat and are virulent for some time after the subsidence of symptoms. Von Ros-thorn agreed with Schatz's observation concerning angina, and rather inclined to the view that the infection may either be by direct contact with the genitalia or hæmatogenous—that is, through the blood stream of the anigal patient.

Pathology and Treatment of Dysmenorrhœa. Mendes de Leon¹ believes that except for isolated cases of acquired stenosis or closure of the cervical canal the mechanical theory for dysmenorrhœa has no foundation. The pain is not due to any obstruction to the outflow of blood, but to the fact that the uterus in part or *in toto* has undergone contraction. Among 3630 dispensary patients there were 147 who complained of painful menstruation; for this reason alone they had come to the dispensary. Among these 128 were found to present typical evidences of endometritis, viz., profuse menstruation, discharge of coagula, or increased flow of mucus. The pain was most severe during the menstrual period, but was also recognizable in the interims, associated with leucorrhœa, and at any time the pain could be produced by touching the mucosa with a sound. The diseased endometrium is the cause of the affection in such cases, which Mendes de Leon would call *endometritis dysmenorrhœica*.

In numberless cases the author could find no obstruction with the sound during the menstrual period, and concludes that any purely mechanical interference with the outflow of blood must be exceptional. In fifteen cases the pain was more severe in type, and appeared with vomiting, headache, vertigo, or fainting spells. In spite of this the discharge of blood was very small in amount and no local abnormality in the genitalia could be found. The sound, however, could be introduced into the uterus without any difficulty, which during the interim encountered during the period nearly insurmountable obstruction at the internal os from contraction of the orifice. For this class of cases the author would hold the name *hysterospasmus*, and thinks it must be regarded as a distinct affection. Why he selects a comparatively few cases among those who have no anatomical alterations in the genitalia

¹ Ueber die Pathogenese und Therapie der Dysmenorrhœe. Vom IV. internationalen Gynäkologenkongress in Rom. Central. f. Gynäk., 1902, No. 46.

cannot be said. It is certain, however, that the condition most frequently occurs in hysterical or neurasthenic subjects. The central nervous system, when weakened, receives these contractions of the internal os as painful contractions, which in health are painless. Mendes de Leon also speaks of ovarian dysmenorrhœa as due to certain changes in the ovary; this form has been proved and undoubtedly exists.

The treatment of dysmenorrhœa, considering these various forms, can, therefore, manifestly, not be the same in each one. For the endometritis dysmenorrhœica one must employ measures directed against the diseased mucosa—cauterization and curettage. The most difficult cases to cure are those of hysterospasmus. While treatment directed against the nervous condition here may do good, permanent relief is to be obtained only by local measures and principally through hyperdistention of the internal os. This the author accomplishes by repeated passage of sounds of increasing size.

A. Theilhaber¹ reminds us that the work of Fliess and Schiff concerning their so-called “nasal dysmenorrhœa” has caused a revision of the teaching on the causes of menstrual colic.

Certainly one cause is mechanical obstruction, but this obtains in the minority of cases. Submucous myomata may excite contractions of the uterus which become strong and painful in the effort of the organ to expel the foreign body.

In perimetritis the usual menstrual contractions are painful because the infiltrated and diseased perimetritic structures are drawn upon; but the cause of the “essential” dysmenorrhœas is not to be found here, and, according to Theilhaber’s experience, these “essential” dysmenorrhœas constitute fully three-fourths of all cases. He believes it is due to a tetanic contraction of the circular muscle fibres at the internal os. Similar tetanic contractions of circular muscles are seen in the œsophagus, heart, pylorus, bowel, etc.

Menge says that the ordinary contractions of the uterus which in health are imperceptible become painful in hysterical and neurasthenic conditions, even though the genital apparatus is entirely healthy. A normal muscle contraction in the normal individual is not usually perceived as painful. This is true of the voluntary and of the involuntary muscles with one exception, viz., circular involuntary muscles surrounding some canal.

It is untenable to regard these essential dysmenorrhœas as due to a hyperæsthesia of the uterus, for it will be remembered that the condition usually disappears after childbirth. The cessation of the pain at the beginning of the flow cannot be taken as an indication of obstruction,

¹ Das Wesen der Dysmenorrhoe. Central. f. Gynäk., 1902, No. 3.

for fluid blood needs no large passageway, and Theilhaber has often passed a sound into the uterus during the antemenstrual colic, and found no blood there. The bleeding is most copious also on the second or third day.

In contrast to the longitudinal fibres of the uterus, which undergo no solution of continuity in labor, the circular muscle of the cervix is stretched and torn. The prompt results following divulsion of the sphincter ani and sphincter vaginæ in painful contractions of these parts is well known, and Theilhaber believes the effect of labor on the cervical sphincter is analogous. He imitates the action of nature by excising a portion of the sphincter at the internal os. The cervix is first dilated and then by means of a specially constructed knife a wedge-shaped piece is removed from the sphincter both anteriorly and posteriorly. The author has employed this method with excellent results in twenty-two cases.

Cox¹ cites cases to show the connection that exists reflexly between the nose and the genital apparatus. Engorgement of the turbinated bodies occurs with regularity in the menstrual epochs. Cox has observed this in a considerable number of cases; sometimes the congestion is so pronounced as to seriously embarrass nasal respiration. This often causes headaches, and occasionally we find the real cause of menstrual headache here. Vicarious menstruation from the nose is well known. There are certain nasal reflexes that occur during sexual excitement. Cox, Van der Weil, Elsberg, Winn, Hobbs, and others have reported cases where the sexual act was accompanied by sneezing, etc. Nasal disease is frequently worse at menstrual periods. The relief of painful menstruation by intranasal application has been reported by Schiff, Fliess, etc. Schiff proved that the pain of dysmenorrhœa was relieved promptly in thirty-four out of thirty-seven cases by the application of 20 per cent. cocaine solution to the "genital spots" of the nose—*i. e.*, the erectile tissue covering the inferior and middle turbinate bones and the septum. Some cases he observed for months and had over two hundred positive results. By first contracting the tissue by suprarenal solution a 3 to 5 per cent. solution of cocaine was efficacious. Chrobak, in seventeen cases, used cauterization with trichloracetic acid or employed electrolysis with no return of dysmenorrhœa in twelve cases under observation from one and one-half to two and one-half years.

The castration of young animals produces lack of development of the erectile tissue of the nose. Jonathan Wright has made some interesting investigations along this line. He procured the heads of a bull and a

¹ The Relation of the Nose to the Reproductive Organs. Brooklyn Medical Journal, July, 1902.

steer of approximately the same age. The difference in the extent and thickness of the erectile tissue in the two animals was quite noteworthy.

Atmocaustic Treatment of the Endometrium in Hæmophilia. Under the term atmocausis Pincus has employed for some years the direct application of superheated steam to cases of metrorrhagia arising from various diseases of the endometrium. Pincus¹ says that the work of Börner, Stumpf, von Limbeck, and others has shown that hæmophilia is more frequent in the female sex than has been generally supposed.

There is a certain number of cases where, as is well known, young women in their first or in subsequent menstrual periods have bled to death, or a curettage for some trifling disorder was followed by the same result. In atmocausis we have a sure cure for such hæmophilic conditions, but several questions arise in connection with its application :

1. Should hæmophilic girls marry ?
2. Has the therapy to take account of subsequent marriage and ability to bear children ?

In answer to the first question one must in general say "No," but Pincus thinks a discussion of this point would lead him too far, and so he drops it. With regard to the second question, there undoubtedly exists cases where the atmocausis must be used to its fullest extent (*castratio uterina atmocaustica*). These are the patients in which one chooses between probable death and the destruction of the power of reproduction. Von Guerard reports a case where he employed this extreme measure. In answer to an inquiry by Pincus he says : "The bleeder is getting along nicely. She has had no recurrence of the menstrual flow, and is fat and robust. She was married, but naturally without result."

Fritsch says Stoeckel's case (of the same sort as von Guerard's) has done very well, and that she has been without menstrual flow as well as free from pain. Of the other cases, where only atmocausis was necessary, Gummert reports that his patient menstruates every three, four, five, and six weeks. The duration is from two to eight days, once profuse, but, as a rule, scant. She is also chlorotic, and has much nose-bleed, but she feels very well. Pincus' case required a second atmocaustic treatment. Subsequently she did not menstruate for two and one-half months. Both von Guerard's and Stoeckel's cases were *in extremis* before they were subjected to atmocaustic uterine castration. Von Guerard's patient was of a hæmophilic family, and her mother and

¹ Zur *Castratio Uterina atmocaustica* bei Hämophilie. *Central. f. Gynäk.*, 1902, No. 22.

sister had died from hemorrhage. Stoeckel's patient was at death's door upon admission to the clinic, but she left it "fresh and rosy."

Pincus believes that if the age of puberty has been happily passed in these hæmophilics then the atmocautic castration is only permissible in the following conditions :

1. In the puerperium when bleeding dangerous to life occurs and facts which make the diagnosis positive are at hand (omphalorrhagia, melæna, etc.).

2. In the hemorrhages of the climacterium. At other times, as in hemorrhage late in the puerperium or after an abortion, one must get along with simple atmocausis, if possible.

Castration by Means of Atmocausis. Pincus¹ speaks of the abrogation of menstruation during the childbearing period in a woman's life by artificial means. By this abrogation of menstruation he means so far as it is taken part in by the endometrium. The therapeutic means employed to destroy the endometrium are many, but the most reliable and applicable is atmocausis.

One intentionally does not speak here of *obliteratio uteri artificialis*. The latter is not a necessary part of a complete destruction of the endometrium. It is often a desirable result and often sought after, but the fact exists that the menopause may be induced by the direct or the remote action of atmocausis, and yet the *cavum uteri* may not be obliterated. But the obliteration of the uterine cavity is certainly the most extensive result of atmocausis, and, as Fritsch says, "There are cases where one without this means would have to extirpate the uterus."

Pincus wishes to add to those cases already reported two which he observed in 1900. The first, a phthisical woman, aged twenty-six years, who had been married four years and had borne two children. The disease had made progress in consequence of pregnancy and of the puerperium, for she was the subject of metrorrhagia that lasted for a week and could not be controlled. With the consent of the family and their physician atmocausis was employed in the hope of abrogating the menstrual and reproductive functions. It must be observed that previous to this treatment the menses were regular, lasted three to four days, and were very profuse. Steam at 110° F. was first employed without anæsthesia and for a period of forty seconds. After the slough had come away, three weeks later, the same method was employed for a period of fifty seconds. Without any inconvenience or pain the menstruation stopped and has not returned. The woman has been benefited, and, although she will probably succumb to phthisis, her life has been prolonged. The uterus is atrophic, and fully obliterated above the internal os.

¹ *Castratio mulieris Uterina*. *Central. f. Gynäk.*, 1902, No. 8.

In the second case the woman was thirty-two years old, had borne four children, and was the subject of Bright's disease. She was at the time suffering from metrorrhagia following labor. The uterus was empty, and there were no signs of malignancy. In each labor she had lost an enormous amount of blood. The menses had been regular, lasted five to six days, and were profuse. In this case steam at 115° C. for one minute was first employed, and one month later again for a minute at 112° C. In both of these cases there was an *indicatio vitalis*, although it was not absolute; but both were relieved in part without pain and had their lives prolonged.

Blood is life, and when in high-grade anæmic conditions every drop counts; if the woman is incurably diseased, it is a valuable therapeutic procedure to destroy the function of menstruation and the possibility of impregnation. This may be accomplished through atmocausis. It is to be emphasized that such a procedure is only to be employed as a means to prolong life in women incurably diseased. All other employment of *castratio uterina atmocautica* is reprehensible.

A. E. Neumann¹ says with regard to this subject that Pincus has lost sight of the effect his procedure would have upon the psychical condition of the patient. It is a very deep-rooted belief that the cessation of the menstrual flow in the course of phthisis is a very unfavorable symptom; by employing Pincus' method we might substitute a psychical detriment for a perhaps unimportant physical loss, and fail in our end. Neumann considers much better the removal of the possibility of pregnancy with the preservation of menstruation. He has described his method of excising a small portion of the tubal neck. This may be done through a small abdominal incision with a little chloroform and in a very few minutes. The woman preserves all her functions, and yet is freed of the only serious risk to which she is exposed, viz., pregnancy.

DEDUCTIONS CONCERNING ATMOCALUSIS FROM AN ANATOMICAL STANDPOINT. Falk² reports two cases of hysterectomy following atmocausis in which careful histological examination was made of the uterine mucosa. Although both were subjected to a temperature of 112° C. for a period of fifteen seconds, hysterectomy was performed in the first case eighteen days afterward; in the second case immediately afterward. The effect of the procedure in the first case was very irregular—a portion of nearly totally destroyed mucosa being sometimes directly contiguous to one scarcely at all affected. In the second case the result was uniform and a scab about 1 to 1½ mm. thick was present over the

¹ Zur Frage der Künstlichen Sterilität phthisischen Frauen. *Central. f. Gynäk.*, 1902, No. 12.

² Ein Beitrag zum Anatomischen Material der Atmocausis. *Monats. f. Gebürts. und Gynäk.*, Band xv., Heft 1.

entire surface of the mucosa. The dissimilarity of the action of *atmocausis* upon the uterine mucosa has been noted by Pitha, von Guerard, Prochownick, Lachman, and others. To prevent too deep local action by the heated apparatus Pincus devised an instrument entirely encased in cellulvert. This tends to limit the action upon the mucosa to the steam alone. But even with this instrument Falk failed in one of his cases. Rösing, in a study of the various forms of intra-uterine douches, with regard to their thoroughness in reaching all parts of the mucosa, employed ferrocyanide of potassium and liquor ferri. It was only when the return flow from the uterus was insufficient and the fluid collected in the uterine cavity or when the catheter was so thin that it could be readily moved about that Rösing obtained a uniform discoloration of the endometrium. While in *atmocausis* we are dealing with the most finely divided particles of heated water and the comparison with Rösing's experiments is not entirely fair, no doubt some of the condensed steam in *atmocausis* coming in contact with portions of mucosa effectually prevent the action of the method in these areas.

Falk believes the irregularity in its action as observed by himself and others depends upon several causes :

1. The character of the instrument, whether sheathed in a material that prevents it from acting by direct contact.

2. The configuration of the uterine cavity. Czempin, Pfannenstiel, and Stoeckel have reported cases in which myomata projecting into the uterine cavity prevented the action of the steam upon one or more areas.

3. Restriction in the motion to which the instrument may be subjected. In von Guerard's case complete obliteration of the uterine canal occurred. Falk advises in using the instrument to continually move it to and fro.

4. Faulty return flow of the condensed steam from the body of the uterus. This is guarded against in the modern instrument by means of a special exit tube.

5. Collections of blood clots within the cavity of the uterus. Such a condition can usually be obviated by swabbing the uterus with cotton before applying the superheated steam.

Artificial Sterilization of Woman. Hugo Hübl¹ says that almost all the methods to be conceived of theoretically to make a woman unfruitful have been put to practical use. He would divide such measures into two classes :

1. Those which imply the removal of an integral part of the sexual apparatus that is necessary to impregnation. The employment of this group he designates castration.

¹ Ueber Künstliche Sterilisirung des Weibes. Monats. f. Gebürts. und Gynäk., Band xvi., Heft 1.

2. Measures which prevent impregnation without the removal of an integral part—sterilization.

It is more customary at present to employ castration.

First of all, the uterus is sometimes removed in cases of repeated Cæsarean section in order to prevent the possibility of further conception. To justify this it has been asked, What further use has a woman for her uterus when she should have no more pregnancies? It is certain, however, that sometimes the removal of this organ occasions those same reflex disturbances that are occasionally found after extirpation of the ovaries. In the light of his views, which will be recited later, Hübl would restrict hysterectomy for castration to those cases where, after Cæsarean section, the uterus is in an infected unhealthy condition. Castration by means of oöphorectomy also finds many adherents. The value of the ovaries to the economy is well known. Halban has proved that they act as the trophic centre of the other genitalia, and not only influence the nutrition and development of the uterus, but also that of the vagina, outer genitalia, and mammary glands. Gottschalk has shown that the uterus without the ovaries undergoes atrophy, and in one instance under his observation gave rise to such pain that total extirpation became imperative. Gottschalk, therefore, believes that whenever the ovaries from diseased conditions demand removal the uterus should be included.

Oöphorectomy has a further disadvantage in young, single women, that it destroys, according to the statistics of Pfister, based upon ninety-nine observations, the sexual impulse. In married women, where sexual life has produced a *libido centralis*, the sexual impulse may remain unchanged. The *libido centralis* takes the place of the *libido sexualis*.

These observations have important weight in a discussion of the pros and cons of oöphorectomy, for if just as efficient a method of preventing impregnation is available the sexual sense must be left undisturbed. Hübl then speaks of the treatment of *osteomalacia* by castration. The value of the measure in this disease has been attributed to three factors :

1. Sterilization of the woman.
2. Artificial climacterium.
3. The metabolic changes which the removal of the ovaries occasion.

Lohlein lays especial stress upon the second one, for to him the abrogation of the premenstrual congestion appears the important element.

Fehling, however, believes the ovaries in these cases to be at fault, and in their perverted activity to constitute a trophoneurotic irritation to the osseous system. Frey, who speaks from a consideration of ninety-one cases, believes all these factors work together. It is by no means certain, however, that the removal of the ovaries alone favorably influences the disease, and many cases of *osteomalacia* are known in which

the affection was materially bettered without removal of those organs. Hübl reports two such cases of his own. He would, therefore, interrupt pregnancy early in cases of osteomalacia, and after the uterus was emptied, perform vaginal hysterectomy or the operation described later on in his paper. The author further considers sterilization. He says a woman is artificially made sterile when the passage of spermatozoa from the vaginal entrance to the ovaries is in some part of the genital tract obstructed. By some it will be said that a married woman who desires no more pregnancies shall simply remain free from sexual intercourse. Such advice is only in a very few cases applicable. Chrobak says: "Frequently the happiness and also the duration of married life depends upon the sexual relations." The unreliability and the harmfulness of coitus interruptus and the employment of injections post-coitus for the destruction of the spermatozoa are known generally to physicians. A guard for the male, if it is made of suitable material and used properly, is reliable. Condoms made out of animal membrane, however, afford transmission to the spermatozoa, according to Lott, and whatever sort is employed it should be thoroughly clean. There are several occlusive means that have been in vogue. These embrace cotton plugs, occlusive sponges, and the protecting pessary. Many attempts have been made in this direction to afford certain occlusion of the genital tract, but this is manifestly impossible below the uterine cavity, and such occlusive measures can, therefore, be regarded only as provisory. Whenever an occlusive pessary is indicated for scientific reasons, in order to ensure its efficiency as far as possible, it should be fitted and placed in position by the physician. In Hübl's practice along this line he employs the ordinary retroversion pessary, to the bars of which is attached a large, loose piece of thin rubber dam. This interferes in no way with sexual congress; indeed, many of his patients report that the ring is entirely unnoticed by their husbands. The woman wearing such a pessary should take a vaginal douche in the recumbent posture daily. The ring must be removed at each menstrual period and as much oftener as necessary, depending upon the character and amount of uterine secretion.

In the second part of his paper the author considers those operations which have been invented and undertaken which occlude the genital tract somewhere above the uterus and effectively prevent conception.

Buettner, in 1897, advised obstruction of the tube near the ampullar extremity, so that if later in life pregnancy became desirable through a second operation (salpingostomy) it might be rendered possible. Hübl agrees with Arendt that this question deserves no consideration whatever; apart from the dangers to which it would expose a woman in the way of extra-uterine gestation the morale of the procedure is bad.

The operations now to be considered may be spoken of as "radical" in contradistinction to those methods given above for sterilization, which may be dubbed "palliative."

First, the tubes have been ligated with silk or catgut. Falaschi, Piesenisky, Fritsch, and Arendt have each published cases where after attempted sterilization in this way pregnancy had occurred. Kossman ligated the tubes in a number of young chickens. After six weeks the hens began to lay, and upon post-mortem it was found that the ligatures had undergone calcification and then been broken by the pressure from the swollen tube. While calcification from the ligatures would not be expected in man, the experiment demonstrates the immense pressure that a swollen tube may occasion.

Secondly, the tube has been ligated in two places and divided between these points or a portion of the tube between them has been resected. Both of these methods are faulty. As the ligatures may become displaced or may cut through the wall of the tube the tubal stump may become patulous. Thus, Ries found this condition present in three cases that were exposed to secondary adnexal operation. Yordon and Sutton have observed pregnancy under such circumstances. The animal experiments of Halban must furnish some valuable deductions in this direction. He implanted portions of the Fallopian tube in the subcutaneous tissues. The examination of these transplanted portions after one and one-half years showed that they had not been fully occluded by the surrounding connective tissue. This shows the difficulty with which a tube lined by mucous membrane is made atretic. Kossman on these grounds has advised division of the tube by means of a Paquelin cautery. R. von Braun buried the uterine end of the tube under peritoneum. Kossman believes here, however, that the giving way of one ligature would allow the mucosa to project through the peritoneal incision, and Rühl actually observed such a case. Buettner has advised section of the tube peripheralward, and closure by inversion of the tubal walls inward, and sutures passed through the serosa and muscularis, followed by a supplementary serous suture. This method is not very easy, and experience only can say it is valuable.

Rühl adopts suturing the uterine stump of the tube into the vaginal fornix. Neuman and Rose have recommended a very simple and yet certain method of sterilization. It is the removal of the tube from the uterus by means of a keel-shaped incision; the wound is closed by muscular and serous sutures. From the researches of L. Fränkel we know that all the other methods except the last one are useless; furthermore, that in ten of twenty-six animals in which after the keel-shaped uterine excision the tube was left behind, hydrosalpinx occurred. Kehrer also found that pyosalpinx or hydrosalpinx usually took place in tubal por-

tions allowed to remain. There is no value in such tubal portions, and, therefore, with Fränkel, Hübl would recommend its excision.

Hübl further discusses the question: "When shall a woman be artificially made unfruitful?" Kehrer and Arendt have looked upon such an operation as being occasionally advisable *per se*, and have given indications for its employment. Arendt writes, however: "Who will have the boldness in a severe form of chronic anæmia, bone or lung tuberculosis, irremediable diseases of the central nervous system, heart failure (in which compensation is somewhat lost during pregnancy), induration of the lung, pyloric stenosis, or chronic nephritis—who would have the boldness under such circumstances to operate upon such a patient and confine her to her bed or to her room for several weeks?" It seems much better here to employ palliative measures, and, if these fail, to induce abortion. When, on the other hand, the woman is less severely ill the indications for an operation undertaken solely to prevent pregnancy are too little substantiated. In cases of contracted pelvis Hübl would prefer either induced labor or abortion, or if the woman were desirous of having a child he would let her go to term, do a Cæsarean section, and at the same time excise the Fallopian tubes to prevent further conception. He believes with Solowig that it is improper to expose a woman to repeated Cæsarean sections. Murdoch Cameron, for this reason, in a series of ten cases of Cæsarean sections, has performed the operation for sterilization eight times. The indications for this operation need not be so tightly drawn when it is carried out in connection with some other necessary operative procedure. In any event, however, the co-operation of a colleague should be sought, and the written consent of the woman and her husband secured. Hübl repeatedly affirms that this entire subject relates only to married women, and under no circumstances should such questions be considered by a physician with regard to the unmarried.

RELATION OF THE VERMIFORM APPENDIX TO PELVIC DISEASE.

Peterson¹ has investigated routinely the condition of the vermiform appendix in fifty-three cases of abdominal section undertaken for pelvic disease. During the first part of this investigation the condition of the organ was noted, and it was removed only when evidently diseased. Later on the appendix was removed whenever the patient's condition seemed to warrant the procedure, and its gross appearance was compared with the microscopic findings. Definitely speaking, in 19 cases the

¹ Appendicitis and Pelvic Disease. American Gynecology, August, 1902.

deductions were made from clinical observations of the appendix; in 34 the organ was removed and subjected to microscopic examination. The results of this examination showed no pathological lesion in 17 cases, obliteration of the appendix in 6 cases, and subacute or chronic processes in the remainder.

With regard to the associated pelvic condition there were 8 cases of double pyosalpinx and one of left unilateral pyosalpinx.

There were 8 ovarian cysts, with 4 cases of chronic appendicitis; and 10 fibroids with but two instances of diseased appendix. In 8 cases the appendix, while not the seat of pus, was found to be buried in adhesions and fixed in the pelvis.

When Shall the Appendix Be Removed by the Gynecologist? Kelly¹ found, among 115 abdominal sections for pelvic disease in which the condition of the vermiform appendix was noted, 64 normal appendices. In 10 cases it was adherent to the right tube or ovary; in 37 it was involved in adhesions; in 3 it was congested, and upon one occasion it was found obliterated at the cæcal end.

Kelly wrote to eighty well-known surgeons and asked them to reply to the following questions:

1. "When the abdomen is opened for other causes, and the perfectly normal appendix is easily accessible, is it your rule to remove it?"

2. "When the appendix is slightly adherent to neighboring structures, as peritoneum, ovarian, or fibroid tumors, do you then remove it?"

The consensus of opinion agreed with Kelly's views upon this subject. He never removes a normal appendix in the course of an operation for other causes. He invariably removes it, however, if there are slight adhesions, and when it is free, if its length exceeds the normal. He does not remove a normal appendix because the operation is attended with a certain amount of risk. There has been nothing to show that the retention of the organ involves a definite risk of its subsequent involvement. It is by no means proved that the appendix is a functionless organ, and there is a possibility that we may yet find that it has some rôle in metabolic activity. Kelly concludes as follows:

1. The appendix should always be examined and its condition noted whenever the abdominal cavity is opened for any reason, provided no additional risk is involved.

2. The opinion of the majority of surgeons in this country is against the removal of a perfectly healthy appendix, 44 to 26 being the proportion shown in Kelly's investigation.

3. The opinion of the large majority of surgeons is in favor of remov-

¹ Under What Circumstances is it Advisable to Remove the Vermiform Appendix when the Abdomen is Opened for Other Reasons? *Journal of the American Medical Association*, October 25, 1902.

ing an appendix which is even slightly adherent to other structures, 60 to 7 being the proportion shown in Kelly's investigation.

4. The fact that the appendix is normal in appearance does not prove that it contains no fecal concretions, for Kelly has found them in a number of instances. Their presence is a sufficient reason for the removal of an apparently healthy appendix.

5. After removal of the right ovary the stump should always be covered with peritoneum in order to prevent the risk of adhesion to the appendix. A long and free appendix should invariably be removed.

EXTRA-UTERINE PREGNANCY.

Mendes de Léon, Lumpe, and Thompson report cases of supposed ovarian pregnancy. Their interpretations, so far as can be judged from the reports of these cases, cannot be accepted as unqualifiedly true. Withauer believes he has discovered a case where the ovum was found implanted upon a portion of the omentum.

Ovarian Pregnancy. Mendes de Léon and Holleman¹ report the microscopic recognition of chorion villi in a hæmatoma of the ovary, and regard the case as a new proof of the possibility of ovarian pregnancy. After cœliotomy they found an oval, thick, dark-red tumor which surmounted the ovary like a cap for a space of $1\frac{1}{2}$ cm. The tumor was not connected with the tube. The hæmatoma, after careful histological study, was considered the result of a ruptured Graafian follicle pregnancy. In the hilus of the ovary strings of large cells were found that were regarded as remnants of the trophoblast or of a decidua serotina.

Lumpe² recalls a paper of Ludwig, in which a case of ovarian pregnancy occurring in Chrobak's clinic was reported. Ludwig was able at that time to collect from the literature 18 cases that he considered authentic. Since Ludwig's paper cases have been reported by Kouwer, Oliver, Tull, von Tussenbroek, and Mendes de Léon. Mayer, in 1845, argued upon the possibility that there was no such thing as true ovarian or abdominal pregnancy, and believed that the ovum was only capable of development in the tubes or uterus. Ahlfeld believes that one dare only reach a diagnosis of ovarian pregnancy when both tubes are found unaffected, when the ovary on the side of the lesion is either not found at all or forms a part of the sac, and when the ovarian ligament goes directly over into the gestation sac. Lumpe believes with others that we may have two forms of ovarian pregnancy. Either the embryo

¹ Ueber ovarial schwangerschaft. *Revue der Gynäkologie*, 1902, Band vi., Heft 3; *Bericht Central. f. Gynäk.*, 1902, No. 91.

² Ein Beitrag zur Casuistik der Eierstockschwangerschaft. *Monats. f. Geburts. und Gynäk.*, Band xv., Heft 1.

in its growth finally passes through the rent in the capsule and leaves its placenta behind, or the rent is closed by adhesions and the embryo in its development distends the ovary and with its liquor amnii forms a sort of cyst.

Lumpe sees no reason to believe otherwise than that the point of attachment of the ovum is not entirely independent of the point of conjunction between the spermatie particle and the ovule. It is, of course, unknown, but the time between the impregnation of the ovum and the formation of its chorion villi must be short. The author believes, therefore, that ovarian pregnancy and placenta prævia are the two extreme positions at which these phenomena may occur. Lumpe describes a case of his own that he considers a true example of ovarian pregnancy. The operation and description of the case are given about as follows :

After incising the peritoneum a thick cyst came into view, which in its entire circumference was adherent to the anterior abdominal wall, omentum, and bowel. The cyst was tympanitic and showed the presence of gas and pus. Upon opening the tumor a fœtus, 53 cm. long, was found, its placenta being adherent to the wall of the cyst. The corresponding tube was for nearly its entire length closely connected with the cyst and drawn out by it. The ovarian ligament passed directly over into the cyst wall. No trace of the left ovary could be found. The author regrets that the sac was so degenerated that any histological examination was useless.

Such cases as Lumpe's of ovarian pregnancy illustrate the entirely insufficient grounds for the diagnosis of this condition. The alterations that may occur in the relations of the adnexa during extra-uterine pregnancy are so innumerable that only after the most painstaking anatomical and histological investigation dare we diagnose the possibility of an affection whose occurrence is doubted by many authorities.

The size of the fœtus in Lumpe's case and especially the degeneration of the cyst wall at once exclude it from any serious regard. The ovary might easily have been overlooked, or it might have formed a part of the wall of the sac and undergone suppuration. The tube, in close relation to the gestation sac, may point to a tubo-ovarian pregnancy—that is, one where the ovum finds insertion in the fimbriæ; or the tube may have earlier ruptured between the layers of the broad ligament, and the ovum may have developed there. Lumpe describes the tube as drawn out over the surface of the cyst.

The length of the tube is usually unaffected in ovarian cyst, but in parovarian formations a distention of the layers of the broad ligament occurs and the tube is elongated.

Thompson¹ considers the subject of ovarian pregnancy and reports such a case. The investigations of Hart, Tait, and Webster have shown that many cases heretofore reported as abdominal and as ovarian pregnancy have been in reality of tubal origin. It must be at once granted that, from the nature of the obstacles to the implantation of the ovum without the uterus and the tubes, ectopic pregnancy except of the tubal variety must be very rare. The possibility of ovarian and of abdominal pregnancy has been the subject of much discussion. It is of necessity very seldom that a spermatozoon will penetrate into a ruptured Graafian follicle and impregnate an ovum still *in situ*. It is equally difficult for an impregnated ovum to find lodgement on the peritoneum which has the power to dispose² of objects larger and more resistant than the ovum. Aside from the objections mentioned Thompson knows of but one formulated hypothesis as to the possibility of ovarian pregnancy.

Webster objects to its possible occurrence on the grounds that the ovum can only find lodgement on structures capable of the genetic reaction, and he considers this reaction limited to the uterus and tube (the offspring of the Müllerian ducts).

Thompson believes that, granting for the moment Webster's hypothesis, if it is true that the fecundated ovum can only find attachment upon tissues subject to decidual growth, then it should be only such structures (decidua) that are capable of nourishing the embryo. That this assumption is false is shown by the fact that in a number of cases of early tubal pregnancy Lange could find no trace of decidua at the insertion of the ovum, and, furthermore, there are indisputable instances in which, in secondary abdominal pregnancy, the placenta has been attached to and nourished from the posterior surface of the peritoneum. A conspicuous feature of the growth of the early ovum is the activity with which the foetal epithelium and chorion penetrates the mother-tissue in an endeavor to fix itself there and to obtain nourishment. It would seem, then, that all that is necessary for the implantation of the ovum is its contact with tissues to which it may become fixed and from which it may derive nourishment. The preponderance of activity seems to be on the side of the ovum. Hart and Sutton have both recently accepted the possibility of ovarian pregnancy.

The case reported by von Tussenbroek has done more to establish the possibility of ovarian pregnancy than anything else. Her specimen was of such an early date that even the macroscopic examination was enough to convince one that the gestation had not arisen from the fimbriated end of the tube nor from the fimbria ovarica. In many supposed cases of ovarian pregnancy the ovum has been implanted on this area, and then

¹ Ovarian Pregnancy, with Report of a Case. American Gynecology, July, 1902.

² J. G. Clark's investigations on the functions of the peritoneum.

later in its growth has involved the ovary. Thompson reports a case of his own that seems to him to leave no doubt as to its identity. In this specimen there was found at the upper and inner pole of the ovary a tumor the size of a horse-chestnut embedded for 1.5 cm. in the ovarian stroma. The Fallopian tube *in toto*, including the fimbriæ of the abdominal ostium and the normal extension of the fimbriæ upon the outer pole of the ovary, were all distinctly recognizable and showed no changes. Section of the dark-red tumor showed a thick wall which seemed to be made up of blood clot separated by fine partitions, the inner wall of the ovisac being drawn into convolutions. The method of attachment was plainly opposite the opening; the foetus was seen attached to the walls of the ovisac in the part above the ovary proper by an umbilical cord 1.5 cm. in length. The foetus itself measured 1.2 cm. in length, not extended. Its appearance was exactly similar to a foetus of the same age developing in the uterus.

In his histological examination Thompson found the ovisac surrounded by blood clots and by layers of tissue that he considers the theca externa and interna of the Graafian follicle in which the pregnancy originated. He finds these layers more pronounced in that part of the circumference of the tumor which lies within the ovary itself, and here the chorion villi and the syncytial masses are described as penetrating the thecal cells. What he considers lutein cells also are found. Thompson bases his diagnosis on the presence of pregnancy and remnants of the corpus luteum close together in the same ovary; upon the fact that there was no supernumerary tube; that the fimbriated extremity of the tube and the fimbria ovarica preserved their normal appearance, and the latter did not extend for any great distance upon the surface of the ovary, and that the tumor occurred at the extreme inner surface of the ovary.

While perhaps Thompson has correctly interpreted his case he has not given us as definite proof as may be possible from his specimen. His histological descriptions are either incomplete or he has taken too much for granted. In the first place, from clinical evidence, it must remain true that implantation of the ovum within the Graafian follicle or upon the peritoneum is problematical, both because of the mechanical difficulties and because there have been so few cases reported that were not immediately ruled out upon critical examination. Webster's opinion is entitled to consideration, for he has perhaps more than any other American studied this subject carefully. His theory of genetic reaction should not be interpreted to mean that the genetic reaction in his sense means the ability to produce decidual cells, for, if this is assumed, it fails at once in the light of recent investigations, which show that decidua-like cells are found upon the peritoneum in Douglas' cul-de-sac during pregnancy, and that in tubal pregnancy their presence is by no means con-

stant at the site of the ovum. Some of the cells at this area that were formerly considered decidual are now recognized as Langhan's cells, directly continuous with the epithelial envelope of the chorion villi. His theory is rather to be regarded as based upon the differentiation of tissues as to their physiological rôle.

Cells which resemble one another microscopically have widely different functions. It is the chief function or the property of those structures derived from the Müllerian ducts to handle and preserve the fecundated ovum. The assumption of this function by another organ or set of tissues appears naturally problematical. Turning now to a discussion of Thompson's report, although the tumor was of the size of a horse-chestnut and two-thirds of its bulk was above the surface of the ovary, Thompson finds on its periphery, even to its upper pole, evidences of the thecal lining of the Graafian follicle in which this gestation is supposed to have occurred. Leaving aside the fact that in most Graafian follicles and surrounding most corpora lutea it is very difficult to identify definitely the thecal layers, which are nothing more than especially vascularized stroma fibres, Thompson's histological description of these fibres might apply to a beginning organization of the periphery of a blood clot lying exposed in the peritoneal cavity. He says: "At this upper part the limiting wall is seen to be composed of fibres which are undoubtedly derived from the theca externa. In places the walls seem to be homogeneous. Above the upper portion of the tumor the theca externa shows few nuclei on the outer margin. Several layers of cells are plainly noticeable on the outer margin, their nuclei staining deeply. Toward the maternal blood pools, however, the nuclei fail entirely in places." Would it not be a remarkable fact, granting that this pregnancy did originate in a Graafian follicle, that after the rupture of the follicle which allowed ingress to the spermatie particle, that the theca itself should not be retracted with the thinned-out ovarian stroma during the growth of the ovum? No ovarian stroma is found except at the base of the tumor. The justification of his diagnosis by the microscope depends upon the recognition of some portion of the follicle epithelium, lutein cells, or the thecal tissue.

Leaving aside the fact that it is questionable if the latter alone would be recognizable, since its penetration by chorion epithelium would disarrange even the most characteristic tissues, Thompson's descriptions are by no means satisfying. He says: "I have been unable to find any of the external ovarian epithelium on the upper part of the tumor, but think it may have been lost in the cutting, as the sections were very thin. As we approach the base, however, and especially where irregularities of the surface seem to protect the outer edge, columnar epithelium is to be seen. In these places the cell body looks clear and glistening,

while the nucleus is only faintly stained. As we approach the base all the tissues become more developed. There may be seen an outside epithelial layer covering the external fibrous coat and patches of the theca interna, divided by fibres derived, as in the formation of the normal corpus luteum, from offshoots of the fibrous external tunic. The nuclei become more marked, staining deeply. In several places the convolutions of the theca interna can be seen lying in the blood which fills up the spaces between the villi. At the base of the tumor the two coats are very plainly to be seen, and here can be seen a condition of things which illustrates in every way the formation of the corpus luteum, the convolutions of the internal coat, the different gradations in loss of their structure, the intersecting fibres derived from the external tunic, well-marked nuclei, with here and there patches of syncytium and ends of villi, some showing the trophoblastic cells and some bare." His words with regard to the presence of luteum cells, which are one of the chief factors in his diagnosis, follow: "Here, too (referring to the area above described), is to be seen in the unstained specimen a patch about twice the size of a pin's head, bright yellow in color, evidently largely made up of lutein cells." While there are some deficiencies in Thompson's chain of argument, upon the whole description of his case we must admit that he has made a very strong demonstration in favor of ovarian pregnancy. In fact, so strong that I do not care to dispute but rather coincide with his claims.

Omental Pregnancy. Withauer¹ reports a case in which he believes a fecundated ovum found primary insertion upon a portion of the omentum.

Bruno Wolff and Kamann have encountered such a condition in the dog, but heretofore no case in man has been reported. The patient was operated upon during internal hemorrhage. Withauer found after evacuating the blood, which filled the abdomen, a strand of omentum that dipped down into the pelvis of the right side. This was held to one side while the adnexa were examined. The right ovary was cystic; the right tube normal; on the left side the adnexa presented no unusual changes. A hæmatoma on the strand of omentum above noted was removed, together with the tube and ovary of the right side. Upon examination microscopically the right tube showed no evidences of pregnancy nor of the previous embedding of an ovum there. The hæmatoma consisted of chorion villi, etc., surrounded by a blood clot that separated it from the omentum, which partially enveloped it. Although no direct communication between any of the chorion villi and

¹ Primäre Bauchhohlengravidetat auf einem Netz-Zipfel. *Central. f. Gynäk.*, 1903, No. 5.

the omental structure itself was found, the author thinks this was due to the immaturity of the ovum, and because it had been evidently separated on all sides by the hemorrhage.

Conservative Treatment of Unruptured Early Ectopic Pregnancy. Von Scanzoni¹ has collected and reviewed a series of cases in which conservative treatment was adopted for extra-uterine gestation that had undergone rupture in the first month. There has always been some question as to the propriety of such conservatism. It has been urged that it not only may cause the loss of the patient, but that it also keeps her longer from the duties of active life, has a tendency to prevent subsequent pregnancies, and exposes her sometimes later on to the necessity for operative interference.

Scanzoni has not lost sight of these objections. Conservative treatment, he believes, should never be attempted unless the patient is confined in a hospital or under other such conditions where a radical procedure, if indicated, could be undertaken without a moment's delay.

In the clinic from which he has taken his statistics, laparotomy was employed in these cases where there were signs of continual bleeding or where the hæmatocele kept increasing in size. As a criticism it may be said that the diagnosis of the cases presented by Scanzoni has not been proved, and that the possibility of pyosalpinx, ovarian cyst, myomata, parametrial exudates, retroflexed gravid uteri has not been excluded. Earlier in the diagnosis of these cases treated conservatively a test aspiration for old blood was always made; furthermore, Scanzoni has examined subsequently a large number of these women, and, therefore, he is able to exclude myomata and cysts. During the period from which his statistics are taken there were 121 laparotomies for extra-uterine gestation, and in but 19 of these was the diagnosis at fault. Eleven times the cases proved to be pyosalpinx, and this affection, with parametrial exudation and perityphlitis, are most apt to be mistaken for extra-uterine pregnancy. By careful observation, history, and examination, in the majority of cases, these conditions may be plainly recognized. The author gives tables showing the relative results of laparotomy, expectant treatment, and elytrotomy. The latter consists in vaginal incision and a thorough cleaning out of the hæmatocele, with no attempt at the removal of adnexa. It was indicated by (1) high fever; (2) increasing severe pain not amenable to palliative measures; (3) no tendency on the part of the hæmatocele to become smaller, and (4) when the hæmatocele was so large that the possibility of its resorption within a suitable time was questionable.

¹ Ueber die Dauerresultate bei conservirender Behandlung frühzeitig unterbrochener Extranteringraviditäten in den ersten Schwangerschaftsmonaten. Archiv f. Gynäk., Band lxx., Heft 3.

It will be seen, therefore, that there were distinct indications observed in the choice of the treatment for each series of cases. The author's results may be conveniently tabulated with respect to the following points:

1. Patient's ability to work after discharge.
2. Subsequent conceptions.
3. Physical condition at a period about a year or more after treatment.

Comparisons are made between 56 cases of purely expectant treatment, 25 elytrotomies, and 38 laparotomies.

TABLE I.—ABILITY TO WORK.

(a) <i>Fully able to work.</i>			Cases.	Per cent.
Of 56 expectant . . . . .	.	.	41	73
Of 25 elytrotomies . . . . .	.	.	19	76
Of 38 laparotomies . . . . .	.	.	24	63
(b) <i>Capable of light work.</i>				
Of 56 expectant . . . . .	.	.	15	27
Of 25 elytrotomies . . . . .	.	.	6	24
Of 38 laparotomies . . . . .	.	.	13	34
(c) <i>Incapable of work.</i>				
Of 56 expectant . . . . .	.	.	0	0
Of 25 elytrotomies . . . . .	.	.	0	0
Of 38 laparotomies . . . . .	.	.	1	38
(d) <i>Capable of light work in one to six weeks after discharge.</i>				
Of 56 expectant . . . . .	.	.	14	25
Of 25 elytrotomies . . . . .	.	.	4	16
Of 38 laparotomies . . . . .	.	.	1	3
(e) <i>Capable of heavy housework (washing, etc.) in one to six weeks after discharge.</i>				
Of 40 expectant . . . . .	.	.	16	40
Of 25 elytrotomies . . . . .	.	.	5	22.5
Of 38 laparotomies . . . . .	.	.	5	14.5
(f) <i>Capable of heavy work in twelve weeks to eight months after discharge.</i>				
Of 40 expectant . . . . .	.	.	35	87.5
Of 22 elytrotomies . . . . .	.	.	21	95
Of 34 laparotomies . . . . .	.	.	25	73

The expectantly treated cases were dismissed fourteen days earlier on the average than those exposed to laparotomy; they were, therefore, naturally able earlier to begin the duties of life. Sixteen of the cases expectantly treated, 3 of those elytrotomized, and 4 of those exposed to laparotomy were subsequently not required to work and are excluded from Table I. (f). This seems unfair, for it may almost be taken for granted that such cases were incapable of heavy work, else they would not have given it up entirely.

This table changed would read :

	Cases.	Per cent.
Of 56 expectant	35	62.6
Of 25 elytrotomies	21	84
Of 38 laparotomies	25	65.7

If now we remember that it was the severer cases which were exposed to laparotomy and that there must remain a certain number of cases of the expectant class in which the diagnosis is open to some doubt, we find, as Scanzoni himself says, that there is not much difference in these results.

TABLE II.—SUBSEQUENT CONCEPTIONS.

	Cases.	Per cent.
Of 43 expectant	16	37.5
Of 18 elytrotomies	10	55
Of 29 laparotomies	5	17

Here the results are distinctly in favor of conservatism, and under conservatism, of course, is included elytrotomy. The cases included in the table were only those exposed frequently to impregnation, and none of the laparotomized patients where the operation rendered the patient sterile are computed.

The results subjectively with regard to the well-being of the patient may be tabulated from the text :

TABLE III.

(a) *Fully free from symptoms.*

	Cases.	Per cent.
Of 56 expectant	22	39.3
Of 25 elytrotomies	16	64
Of 38 laparotomies	23	60

(b) *Occasional abdominal pain.*

	Cases.	Per cent.
Of 56 expectant	22	39.3
Of 25 elytrotomies	9	36
Of 38 laparotomies	15	40

Here the results in general appear less favorable to the purely expectant treatment, although Scanzoni regards the personal equation as a very disturbing factor, and would rather draw conclusions from the condition of the woman with regard to work.

The only other author who has made investigations along the same lines as Scanzoni is Prochownick. The latter comes to the conclusion that early operative interference in these cases of extra-uterine gestation is the best and most certain form of conservatism. Of 50 laparotomies Prochownick had 41 good results; of 18 vaginal incisions, 12 resulted favorably; of 19 expectantly treated, a few did surprisingly well, but the majority kept on ailing. As regards subsequent pregnancy, Prochownick found 21 cases in 39 laparotomies—i. e., 53 per cent.; 50

per cent. in the expectantly and 22 per cent. in those treated by ely-trotomy. The discrepancy between these figures and his own Scanzoni seeks to explain upon the ground of personal equation, difference in operative technique, etc. Perhaps, he says, both series of cases are too small to show any very definite conclusion. While Prochownick speaks in each case for operation, Scanzoni believes from his observations that these early cases of extra-uterine pregnancy should be treated by laparotomy, elytrotomy, or expectantly, according to the indications as already given in this paper.

POSTOPERATIVE FEMORAL THROMBOPHLEBITIS.

Clark¹ has made a study of post-operative femoral thrombophlebitis. This is the variety of thrombosis which most interests the abdominal surgeon, and is strikingly peculiar in that, as is well known, its occurrence is entirely independent of the gravity of the operation.

Various theories have been offered to explain this affection, none of which seem to be tenable in view of the clinical history of these cases. Clark bases the theory which he has to offer upon an analysis of 41 cases of thrombophlebitis occurring in a series of 3000 abdominal sections. In this analysis it was immediately remarkable that not once did thrombophlebitis follow perineal or vaginal procedures; this seemed to be in accord with another clinical fact, viz., that extensive pelvic operations—that is, those embracing the bases of the broad ligaments and the large pelvic vessels—were but very infrequently followed by thrombosis. If the postoperative complication under consideration had anything in common with the vascular area of the internal iliac vessels, which embraces the pelvic and perineal circulation, one would expect to find the very opposite of these facts. At any rate, it would be difficult for thrombophlebitis originating in the internal iliac vascular area to reach the femorals. As can be easily seen, this would be possible only by retrograde transportation. Thrombophlebitis sometimes, of course, is due to infection, but in the particular variety of the disease which Clark has discussed infection seems to play no part, in view of the following facts: It is seldom preceded or accompanied by febrile reaction that is significant of pyogenic infection; in many cases the temperature is normal or approximately normal, and it seldom rises above 101° F. No disproportionate rapidity of the pulse was observed as was regarded as significant in infectious phlebitis by Mahler, Wyder, and Singer. If the disease were due to infection, then one would naturally suppose that such

¹ Etiology of Postoperative Femoral Thrombophlebitis. University of Pennsylvania Medical Bulletin, July, 1902.

cases as pyosalpinx, infected hæmatoceles, and pelvic abscess would form the great majority of cœliotomies that are followed by phlebitis. This is entirely contradicted by facts, for in 3000 sections and among 41 cases of phlebitis Clark found but 2 that were surgically unclean. Furthermore, in laparotomies, where infection occurs at the time of operation, this complication is not observed. If postoperative thrombophlebitis were infectious it should customarily appear before the eighth to the fifteenth day, and some of the cases would die. The author concluded, therefore, that infection and traumatism within the internal iliac distribution could be thrown out of consideration. Any influences brought to bear on the ovarian circulation might also be excluded, as these vessels have to do with the abdominal blood channels. There remained, then, but one set of vessels that were brought within the manipulations of cœliotomy, and were connected with the femoral circulation, and these are the epigastrics. It will be remembered that the superficial epigastric vein, collecting its blood from the entire lower and central abdominal surface, empties into the femoral vein at the saphenous opening. The deep vessel, pursuing approximately the same course within the layers of the abdominal wall, empties into the external iliac vein just above Poupart's ligament. As the infectious nature of postoperative femoral thrombophlebitis is so doubtful, one is compelled to turn toward the mechanical side. This, with respect to the internal iliac and ovarian vessels, as has been shown, is negative. But how about the epigastrics? In discussing mechanical disturbances as factors in thrombosis, Welch places most weight upon von Recklinghausen's view, who claims that it is not so much a slowing and irregularity in blood currents that lead to thrombosis as it is a disturbing eddying or whirlpool-like motion ("wirbelbewegung"). This is most apt to occur where smaller vessels empty into much larger ones at right angles, and where the walls of the vessel are so fixed by attachment that they do not readily adapt themselves to a varying quantity of the circulating medium. Do such conditions obtain at the mouths of the epigastric veins? An affirmative answer is unnecessary. The anatomical configuration of the external iliac and femoral veins, from Poupart's ligament to the saphenous opening and the angle at which the epigastric vessels empty into them, furnish exactly the conditions von Recklinghausen has described. Is the theory of mechanical insult to these vessels borne out by clinical facts? Undoubtedly this is true. In every cœliotomy (median) the epigastric radicles are involved, and in many cases the larger vessels themselves. Clark found in his analysis that most of the cases followed operations where there had been considerable or prolonged traction on the sides of the abdominal incision.

Following simple suspension of the uterus, as directly substantiated by a case of Clark's, the vessels are sometimes included or wounded by the peritoneal stitch; in his case this produced marked epigastric thrombosis propagated to the femorals; the condition described was found at a second coeliotomy three months after the first, which had been followed by femoral thrombophlebitis.

The author's conclusions in relation to postoperative femoral thrombophlebitis are as follows:

" 1. It occurs in cases where traumatism due to heavy retraction, as in the delivery and operation upon fibroid tumors, adherent cysts, and cancer of the uterus, may directly injure the epigastric vessels, especially by digging the end of the retractor into the under surface of the abdominal wall at a position where the deep epigastric vessels may directly be injured.

" 2. A relatively large proportion of cases occurs in the operation for suspension of the uterus where the peritoneum is drawn out and the ligatures passed laterally in about the position to catch the epigastric vessels or make sufficient traction upon them to induce the formation of a thrombus.

" 3. The entrance of the epigastric vessels just above Poupart's ligament at right or obtuse angles to the main venous currents along with the superficial epigastrics, immediately below in the femoral, and the circumflex iliac, set up an extensive eddying or whirlpool movement essential to the propagation or formation of a thrombus.

" 4. The interval of eight to fifteen days between the time of the operation and the appearance of symptoms of femoral thrombosis is accounted for by the slow growth of the thrombus in the deep epigastric, thus gradually extending until the advancing plug is thrust out into the venous whirlpool beneath Poupart's ligament.

" 5. The greater frequency of the occurrence of a left rather than a right-sided thrombosis is doubtless due to the presence of the mechanical conditions on the left side, which still further slow and derange the femoral and iliac circulation, thus favoring the propagation of the thrombus downward into the femoral vessel.

" 6. Thrombi are quite likely formed in the epigastric vein after many abdominal operations, but only in rare exceptions are they propagated beyond these vessels; hence the infrequency of femoral thrombi as a postoperative sequel.

" 7. The fact that there are on each side two deep epigastric veins which freely anastomose with one another also explains why the femoral vein is seldom reached by the propagating thrombus, for in the event of a segmental occlusion of one vein, the other, by compensation, may carry a freer blood current into the iliac vein.

“8. Femoral thrombi are slow in formation and likewise slow in disappearance, for when once formed they tend to perpetuate themselves and only finally give way by slow liquefaction.”

MYOMA UTERI.

The Preferable Operation for Myoma Uteri. Two very interesting papers on the choice of operation for fibromyomata of the uterus have appeared during the last year—one, by Prof. Olshausen, of Berlin; the other by Prof. A. Martin, of Greifswald. The first argues for the abdominal route, the other for the vaginal. Let us see which makes the strongest appeal to our surgical judgment.

Olshausen¹ says the operative treatment of myoma must now be considered in a new light, viz., how far it is advisable to conserve the uterus or the ovaries or both.

In the Berlin Gynecological Congress, 1899, Zweifel pointed out that the artificially induced climacterium caused more suffering than the natural one.

Zweifel, therefore, always leaves the ovaries, because if the uterus is totally removed these organs soon atrophy. He also believes in the retention where possible of a portion of the uterus, so that menstruation may continue. He prefers the term *resectio-uteri* for this procedure rather than supravaginal amputation. Olshausen agrees with Werth that excitement, cold perspiration, and psychoses incident to the artificial climacterium are the result of a failure of the internal secretion of the ovary.

Olshausen has for more than a year, according to the principles of Rosthorn, Zweifel, and Werth, whenever possible, allowed one or both ovaries to remain. Among 48 cases of supravaginal amputation in the years 1900 and 1901 he left both ovaries in 7 cases and one ovary in 30; both were removed in 11 cases, but 10 of these were patients between forty-six and fifty-four years old. Concerning the subsequent affections of ovaries allowed to remain, Olshausen has observed cystic degeneration a number of times. He gives the historical data in four cases which followed vaginal hysterectomy for carcinoma and believes that here it was due to defective circulation, as he is in the habit of placing his topmost ligature in this operation close to the ovarian hilus. Werth, using the same technique, found in a woman who died four days after supravaginal amputation a hemorrhagic infarct of the ovary. On this account Olshausen recommends a careful preservation of the ovarian circulation. Olshausen agrees with Zweifel that as much

¹ Ueber die Wahl der Operation bei Myomen. *Central. f. Gynäk.*, 1902, No. 1.

of the uterus should be allowed to remain as possible. Such a resection, if the fibroid is favorably placed, as in the fundus of the uterus, allows one to conserve a considerable portion of the organ, but a favorable situation is the exception rather than the rule. It is more frequently possible through enucleation to conserve the entire corpus uteri. From 1897 to 1899, Olshausen, in 207 myoma operations, performed myomectomy twenty-nine times—14 per cent. of the cases. Since then he has employed the operation oftener (intraligamentary fibroids not included). In 1900 and 1901, in 136 operations, he performed enucleation thirty-seven times, or, in 27 per cent. of the cases. In younger women the possibility of a recurrence or further growth of small fibroid nodules must be borne in mind and laid before the patient for consideration. Olshausen has observed this sequel but once, and that occurred in a patient aged forty-three years, and necessitated a second operation two years later; but this could have been avoided had he at the time known how widely the enucleation might be employed in the individual case. He has in the last year removed three to six, even nine myomata and more from the same uterus. The weight of the removed tumor mass reached sometimes 500 to 1000 gm. (one to two pounds); the highest was 3850 gm. (eight pounds). After such an enucleation the uterus is often twice the size of the normal organ, and even so when no more nodules are to be discovered; but it is remarkable how quickly the organ regains its normal size and shape. This usually occurs within three months. The question of when one, in a given operation, dare be satisfied with enucleation is sometimes difficult, and may not always be determined before the abdomen is opened. This is especially so when there are not subserous multiple growths, but a large, smooth myoma occupying the position of the uterine fundus. There are two guiding indicators for the proper procedure in these cases. First, if the ovaries are raised up high on the surface of the growth, usually supravaginal amputation is preferable; whereas, if the ovaries lie deep in the pelvis, the growth is usually well circumscribed to the fundus and may be enucleated. If the length of the uterine cavity is over 11 cm. (five inches) enucleation had better not be attempted.

Relating to the technique, Olshausen stops all bleeding points by sutures and closes the bed of the tumor in layers by means of catgut, avoiding silk as much as possible. The results of the operation in his clinic show five deaths, but some accidents are accountable for this record.

One patient died of pneumonia, having undergone two operations on the same day, myomectomy and thyroidectomy; a second was pregnant at the time of operation and the uterus ruptured at the subsequent labor; two others died of ileus.

Olshausen believes, in view of the advisability of enucleation when

possible, that vaginal hysteromyomectomy should be very limited in its application. It is necessary often to make a careful surface examination of the uterus before deciding upon the best procedure, and in a vaginal operation this is only possible after completely turning the organ through the anterior vaginal vault, and the latter can only be attempted if the tumor is small. When one, by splitting the anterior uterine wall, can enucleate isolated submucous myomata from the corpus uteri, and when there are certainly but one or two subserous nodules and these are open to attack through the vaginal fornices, then only, according to Olshausen, is vaginal myomectomy justifiable. But if there are multiple nodules in the uterus and if the uterus is larger than a two or at most three months' pregnancy, then Olshausen believes with Rosthorn that the abdominal route is always preferable. Olshausen finally predicts that supravaginal amputation will in the future be replaced more and more by enucleation; that the latter is no longer to be applied only to cases in which there are one or two small myomata; and that the abdominal operation is the one of choice. The vaginal operation is for the most part entirely unsuitable.

From my experience in these cases I fully indorse Olshausen's views, for I believe his conclusions are based upon logical surgical data from first to last. If, therefore, I look with prejudice upon the views of Martin, which follow, it is because the immediate and post-operative results in the operation which I have performed along the line as laid down above have been permanently satisfactory.

A. Martin¹ says, that while there is now a general consensus of opinion as to the necessity for prompt surgical extirpation of ovarian growths, fibromyomata of the uterus are looked upon in general as benign tumors, and the importance of their early removal is not uniformly recognized.

While pathologically these tumors are benign, clinically they are sufficiently dangerous to be considered by him as malignant. Martin, in 1888, in 20.4 per cent. of 200 cases found this true, and since that time the investigations concerning "myoma heart" and malignant degeneration of these tumors he believes has emphasized the truth of his earlier assertions. Indications for the operative removal of these growths depend not so much upon their size as upon the alterations in the general health of the patient.

To many the vaginal operation for the removal of myomata appears more difficult and more satisfactory in its results than the abdominal. This statement should not be passed over without a very positive chal-

¹ Sollen Myome vaginal oder abdominal angegriffen werden. *Central. f. Gynäk.*, 1902, No. 14.

lenge, for certainly American surgeons only exceptionally take this view. In the vaginal operation, although at first sight it appears formidable on account of the space to which the manoeuvres must be confined, one may obtain an excellent view of the entire field of operation and may obtain control hemorrhage with great security. Again this statement must be qualified, for most dangerous if not fatal hemorrhages occur unless the tumor is of insignificant size, when, as stated by Olshausen, its resection by the abdominal route is the preferable method. A comparison by Martin of the results of the two operations with regard to hernia is directly in favor of the vaginal; even where the abdominal incision heals kindly there are often adhesions between the belly wall and the bowel or mesentery.

The border-line of cases suitable for vaginal extirpation is determined not by the size of the growth, for by morcellement their proportions may be easily reduced. Tumors, however, which have grown widely into the abdominal cavity should only exceptionally be exposed to colpotomy, and then only when by pressure they can be made to enter the pelvis. The abdominal operation also is indicated when, from the history, previous inflammatory pelvic conditions are indicated, and where the physical examination reveals an immobility of the tumor or adhesions between it and the neighboring organs, especially the bowel and omentum. When the tumor lies deep in the pelvis, bound down by adhesions, or when it has developed between the layers of the broad ligament, the vaginal operation is very satisfactory. In such cases the question of hæmostasis is not so important as that of the possible injury to neighboring organs. The bladder is exposed to injury through cedematous infiltration, often one of the pressure indications of myomata. Martin has never injured the ureters in colpotomy, while such a misfortune has occurred several times in the abdominal operation. While injuries to the bladder and ureter may be repaired without much difficulty, working from below, Martin, in one case, where he injured the rectum, because of the inaccessibility of the laceration, was compelled to open the abdomen from above. Vaginal myomectomy is facilitated through Schuchardt's vaginoperineal incision. This consists in a division of the introitus in a line to the left of the rectum. It is easily sewn up at the close of the operation and gives rise to no sequelæ. Martin does not give much attention in his paper to the relative indications between enucleation and total extirpation. He merely says that in a younger woman, after the tumors have been enucleated, if the uterus can be well reconstructed, that it should be; whereas, if this is not feasible and in older patients, total extirpation is the safest course. Martin admits that the technique of the abdominal incision has been much improved, and that the results are much more satisfactory, but he lays great stress on

the occurrence of stitch abscesses and adhesions between the line of incision and the omentum or bowel. He reports 31 abdominal operations, 26 total, with 6 deaths, and 87 vaginal myotomies, 35 total, with 2 fatal terminations.

Martin¹ reports that from 1893 to 1899 he had performed 141 myomectomies; 50 of these cases he has tabulated; 40 were vaginal operations without mortality; 10 were abdominal, and 3 of the patients died. Six of the enucleation cases were subsequently operated upon for other conditions, and the uterus was found normal in shape and the surface of the organ was entirely smooth.

Of Martin's 141 cases only 4 had a recurrence; 5 of the women bore children with no untoward effects. In the operation it is necessary to have the uterus fully free from adhesions and in good view before deciding upon enucleation or upon extirpation. This, also, often depends upon the condition of the adnexa. Myomata may be enucleated without opening the endometrial cavity in most cases, and if there are several it is wise to endeavor to enucleate each one of them through the same incision in the uterine wall. In view of the fact that Martin has had such a high mortality in his abdominal section cases, it is no wonder that he resorts to a procedure which offers better results. If he lost 6 cases in 31 abdominal sections one can at best feel that his technique was defective. From the study of Olshausen's and Martin's papers we can reach but one conclusion, and that is that Olshausen has unquestionably the better views.

As these papers have been reviewed and criticised by a fellow countryman of these writers it will be interesting to see how he settles these differences.

Thorn² contrasts the views of Olshausen, A. Martin, and his own with regard to this important question. While Martin prefers the vaginal method—i. e., by means of a vaginal incision for enucleation—Olshausen believes the abdominal is best, and thinks that the vaginal operation for both enucleation and hysterectomy is limited.

Martin gives as a necessary condition preliminary to enucleation the ability to freely expose the uterus; he also, on account of the adnexal disease often found in connection with myomata, does not approve of approaching these tumors through the dilated cervical canal. Thorn coincides with Martin's first statement, but does not accept the second, for he has had a number of cases of submucous and intramural myomata in which he believes an exact examination of the uterine cavity was indispensable. Myomata suitable for vaginal extirpation, through an anterior or a pos-

¹ *Monatsschrift f. Geburts und Gynäk.*, Band xiv., Heft 5.

² *Ueber vaginale Myomotomie und das Verhältniss der Enukleation zur Totalexstirpation.* *Central f. Gynäk.*, 1902, No. 11.

terior incision, are not larger than a man's fist, and the greater majority of myomata of that size which give rise to symptoms demanding removal lie either in the anterior or posterior wall of the uterus, or in the cornua, and are mostly submucous or submucous intramural. Most of such tumors are really submucous and single. Why, then, in such cases, Thorn asks, are we to disregard the natural way of approaching them? For they are sometimes spontaneously evacuated through the cervix. Thorn thinks that in all such cases at least a thorough intra-uterine digital examination is necessary to determine the exact condition, and in favorable cases the growth may be removed through the dilated cervix. If the myoma is decidedly intramural Thorn prefers the anterior vaginal incision as recommended by Dührssen and Martin; colpotomia posterior he employs in subserous and intraligamentary growths. As a last resort in these vaginal operations splitting of the wall of the uterus, including the cervix, may be resorted to, although this is only permissible under urgent necessity, for it may injure the organ functionally. When the myomatous uterus is considerably enlarged after the extirpation of the chief tumor, the organ should be invaginated into the vagina and examined. Then, and only then, may one say positively if the organ is to be repaired and replaced or to be totally extirpated.

By this invagination of the uterus into the vagina as favorable an examination is possible as when one has opened the peritoneal cavity. Thorn says it is only in tumors of the size of a man's fist that this procedure is primarily possible, but in the larger growths free access to all surfaces of the mass may be gained after morcellement and enucleation of the largest tumor.

Even where a number of growths have been removed, by suturing the beds of these, the uterus may be restored to its form; but in a large proportion of cases, depending upon the amount of trauma incident to the enucleation, the uterus is worthless or dangerous as a reproductive organ; many of the patients are beyond forty years of age, and the adnexa, especially the ovaries, show associated disease. As to the disturbances incident to a suddenly induced artificial menopause, Thorn sees no difference between them and those of the natural menopause when it comes on quickly, for the menopause simply represents the cessation of ovulation, the disappearance of the menstrual flow, and a more or less rapid atrophy of the uterus. In neuropathic individuals these phenomena are attended with striking nervous and psychical disturbances. Of course, in such people the operative interference incident to the induced menopause would heighten such nervous manifestations. Thorn is inclined to regard these symptoms with indifference, inasmuch as the five cases that he has observed recovered promptly. The severest case of this series occurred in a woman, aged sixty-nine years. After total extir-

pation for myomata evidences of the artificial menopause are more marked than after radical carcinoma operations, because in myoma the suffering has been of long duration and the patient has gradually become more nervous than originally. Because of frequent recurrence or further growth of myomata and the subsequent disease of the ovaries, Thorn of late has chosen more and more the radical operation in women over forty years. Three times ovarian tumors have arisen in organs allowed to remain.

In a first series of cases of 32 vaginal operations he performed enucleation twenty-six times. In a second series of 90 cases he employed enucleation upon twenty-six occasions, and upon the other 64 performed total extirpation. There were 2 deaths in this series of cases, 1 from pulmonary embolism; the other from nephritis. The entire 122 vaginal operations represent about 58 per cent. of Thorn's operations for myoma. Earlier he would have been inclined to adopt the abdominal route in 50 of these total extirpations, for in 42 the uterus was the size of a child's head; in 18 there were coincident ovarian tumors; in 10 hydrosalpinx; in 5 double pyosalpinx.

In 9 of 52 enucleations there was a further development of myomata, and 4 required a second operation. Of these cases 3 had been subjected to the minutest examination at the time of the first operation for additional nodules and none were found. This recurrence is a serious matter, for the surgeon in the light of its possibility cannot promise the patient that she will be freed from the disease by operation.

Fibroid tumors of the uterus, with their many possibilities—malignant degenerations, alterations in the vessel walls, etc.—are more and more being looked upon as dangerous growths. If they are submucous and easily shelled out through the dilated cervix, then, of course, enucleation is the operation of choice; but what can be said, in the light of these facts, about a severe, life-endangering operation, which, indeed, leaves a uterus, but one that is perhaps fit only for menstruation and not for childbearing? In regard to the choice between the abdominal and vaginal operations Thorn believes that, taken for granted one is performed as well as the other, the latter should be chosen, because it frees the patient from the risk of hernia, and this is a very important question among the laboring classes.

Among 9 abdominal operations for larger myomata Thorn lost 2 patients: 1 from ileus, another from chronic peritonitis.

From this review of Thorn it is likewise evident that his mortality and disabling sequelæ are also high, much higher than they should be if a proper technique is maintained. His argument, therefore, does not prejudice one against Olshausen's views.

TUBERCULOSIS OF THE GENITO-URINARY SYSTEM.

It has been our endeavor to cover the more important papers published on this subject during the past eighteen months. As will be seen, the field has been very fully covered by various writers, and much instructive material may be drawn from these papers.

Hartz¹ has written a comprehensive and exhaustive review of the literature upon genital tuberculosis in the female.

Frequency of Genital Tuberculosis in the Female. In 3386 female bodies examined post-mortem Schramm found 1 per cent. of genital tuberculosis; among 1300 subjects Posner had a percentage of 5. Other figures have been given by Cler (1.4 per cent.), Winckel (1 per cent.), Kewisch (2.5 per cent.), and Puech (2 per cent.). Whitridge Williams found 8 per cent. of inflammatory adnexal disease to be tuberculous. From 300 gynecological cases Stratz observed 22 of genital tuberculosis. Martin records 10 among 287 cases. Menge found tubercle bacilli nine times in the genital secretion of 122 patients. Frerichs had 15 cases of genital tuberculosis among 96 tuberculous patients, and Namias had a proportion of 15 per cent. These figures are not too high. As von Franque has shown, even in histological examination the disease may be overlooked. He examined two tubes in 250 and 290 serial sections, and found only in a few sections positive evidence of the disease.

Age of Patient. Tubercle bacilli have been found by Birch-Hirschfeld and Schmorl in the fœtus. Schmorl and Kockel have repeatedly found tubercles of the placenta. Maas observed tuberculosis of the uterus and adnexa in a child aged five years. Brindeau and Talemon, Mosler, Frerichs, Demme, Stolper, and Amann have all observed cases in children. The disease is, of course, most frequent during the procreative period.* Cases in advanced years are rare.

Etiology and Pathology. Genital tuberculosis may be acute or chronic. The acute form occurs with acute miliary tuberculosis. The chronic form is either primary or secondary. The secondary variety is much more frequent than the primary, and many of the cases reported as primary belong to the secondary form. It is impossible, even in a most careful anatomical examination, to discover every possible tuberculous infection of the glands, bones, or lungs. It is manifestly still more difficult to establish a clinical diagnosis of primary tuberculosis. Some observers—Klebs, Scanzoni—have denied the possibility of primary genital tuberculosis, but there exists no doubt that every part of the

¹ Ueber die Tuberkulose der Weiblichen Genitalorgane. Monats. f. Geburts. und Gynäk., Band xvi., Heft 3.

genital tract from the vulva to the ovary may be primarily or secondarily affected by this disease. There is further distinguished an ascending and a descending variety. The descending is the more frequent.

The cause of the disease is, of course, the reception into the body and its further development there of the tubercle bacillus. We know to-day that its deposit alone within the genitalia is insufficient to propagate the disease, for just as in other parts of the body a certain predisposition or favorable circumstance for its growth must obtain.

According to Hegar, such predisposing causes are general nutritive and developmental disturbances, as shown by very slight osseous formation, light deposits of fat, deficient musculature, anæmic conditions, severe chlorosis, and catarrhal and infectious diseases of the genitalia, as gonorrhœa. The puerperium also favors the growth of the tubercle bacillus. Arterio-sclerosis, malformations, and trauma of the genitalia predispose to the affection. The tubercle bacillus gains access to the genitalia sometimes directly from without. They may be conveyed from the individual herself (fecal matter, sputum, pus), or they come from the outer world, through the air, from closets, bedclothing, towels, or sponges. Also, through the examining finger or instruments of the physician, and, more rarely, through coitus with a tuberculous male.

Ferner has reported four cases of primary tuberculosis in women with phthisical husbands. Schuchardt was convinced by his observations that the infection not infrequently occurred through coitus. That this is relatively a very infrequent cause I believe goes without argument, for the mere fact that the wives of tuberculous men very rarely have genital tuberculosis would at once forestall this discussion.

Tubercle bacilli deposited upon the vulva or within the vagina may set up local disturbances or they may be transported higher. Althum says they may either (1) through small abrasions reach the lymph spaces in the paravaginal tissues and from there reach the tubes or peritoneum, or (2) by contiguity and continuity pass along the mucosa, or (3) through mechanical agents (finger, instruments, spermatozoa) be transported higher in the genital tract.

In not every case of ascending tuberculosis do the bacilli find access through the vagina. This is proved by the cases of Dehnerdt, Kratz, and Heiberg, in which the vagina or cervix was occluded.

In the descending forms of tuberculosis the bacilli come from tuberculous collections elsewhere in the body, either by continuity (mesentery, bowel, bladder) or through the lymph and blood channels. Since we have known that phthisis may occur not only from a direct passage along the air-passages of the infecting organism, but that it also occurs from the transportation through the blood and lymph channels of bacilli lodged in the mucosa of the mouth and throat, we are easily able to see how the

germs might be carried directly to the genital tract and thus produce a primary ascending tuberculosis.

Alterthum¹ speaks of the similarity in the gross appearance of carcinoma and tuberculosis of the portio. Proliferative and metastatic processes of the epithelium in tuberculosis are already well known. This has been spoken of with regard to the endometrium by von Franque, Orthmann, Walther, Alterthum, Neumeister, Michaelis, and Kundrat. Alterthum says he was the first to observe its significance, and that Michaelis in a later case has corroborated his conclusions. Apparently, the pathological changes occurring in tuberculosis of the endometrium are the same as those observed in the cervix. Bulius, in the *Encyclopädia* of Sänger-Herff, in his article on Tuberculosis, says that there are to be distinguished in tuberculous endometritis two chief forms. In one variety the stroma of the mucosa is marked with epithelioid and giant cells, cheesy collections, and granular tissue; the glands are scattered; the surface of the epithelium remains intact. In the second variety, which begins in the surface epithelium, there occurs a hyperplasia and metaplasia of the surface and glandular epithelium. In both varieties there is finally an entire destruction of the mucosa and a filling of the uterine cavity with caseous masses. In the case that Alterthum now reports, as well as in his first one, the affection began in the surface epithelium. No tubercles or giant cells were found, but upon staining after the Kaufman-Kühne-Borrel method tubercle bacilli were discovered. His description of the histological appearance is somewhat as follows: The surface epithelium and that of the glands shows proliferative and degenerative changes. Particular glands were entirely filled up by the proliferated cells, but even where this proliferation was superficial and there was no breaking through of the membrana propria there were instances in the cells themselves of mitosis, vacuolization, hyperchromatosis, and degeneration. There was a small infiltration of round cells not only in the epithelium, but also in the region of the bloodvessels of the stroma. He found the tubercle bacilli in the detritus upon the surface.

Amann² believes that congenital tuberculous infection occurs in man, and that it certainly is transmitted by means of the blood. The localization of the process may take place in any of the organs, as, for instance, in the genital tract. Many cases of tuberculosis of the genitalia in small children are to be explained in this way. In such cases, however, the process has often first found root in the lymphatic glands.

¹ Zur Pathologie und Diagnose der Cervix tuberkulose. Central. f. Gynäk, 1902, No. 8.

² Ueber die Genitaltuberculose; vom IV. internationalen Gynäk. Kongress in Rom. Central. f. Gynäk., 1902, No. 45.

Apparently, the genital tuberculosis of children heals quickly, although a prolonged latent period is possible. Very infrequently an infection of the external genitalia occurs through local means. In older children and in adults the infection is primary almost without exception in the respiratory tract. It may much less frequently be primary in the bowel or in the mesenteric glands. The tracheobronchial glands may be diseased without there being any evidence of infection along the respiratory mucous surface. The same is true of the cervical glands with respect to the external genitalia and vagina. Upon caseation of the affected glands the tubercle bacilli increase to considerable numbers in the lymph glands; through erosion of the neighboring bloodvessel walls the bacilli gain access to the blood stream and produce a secondary localization. It is certain that the primary seat may be cured and undergo calcification, while the secondarily infected areas are less resistant and the disease becomes widespread and even gives rise to miliary tuberculosis. This means of infection of the genitalia is the only one that is definitely known. Tuberculosis more often affects the genital organs of the female than those of the male, the proportion being about 7 to 1. Hyperplasia of the genitalia seems to predispose to it, and the same is true of chronic gonorrhoeal disease and of the puerperium. The mode of infection is seldom through the bowel, peritoneum, or lymph channels.

The affection usually first affects the tube; from this results an extension of the process into the uterus, cervix, and vagina; although it may be primarily more or less diffuse. The existence of a primary genital tuberculosis from an infection externally is in the highest degree doubtful. Examples of so-called primary tuberculosis of the genitalia are almost without exception doubtful. Neither a clinical study of the cases nor the observations made at operation in a given case are sufficient to answer this question, which demands a careful autopsy and thorough search for a primary nidus of infection.

The mode of extension of tuberculosis within the genitalia is without bearing upon its primary or its secondary nature. It is probably carried upward in connection with the spermatozoa, which are able to make headway against the flow from within outward. Probably, also, some of the tubercle bacilli adhere to the spermatozoa. In regard to the so-called cohabitation infection, from a prolonged residence with a tuberculous male, there is much more likelihood under such conditions of an infection of the woman's respiratory passages. The assertion of such pathologists as Bollinger, von Recklinghausen, Ribbert, Schmorl, Aschoff, and Albrecht that they have never seen a positive case of primary genital tuberculosis in the adult, is of considerable import. The terms—ascending and descending—as applied to tuberculosis are valueless, because in the so-called primary, apparently ascending types the tubes are usually

the parts first affected. The possibility of external infection of the genitalia is positively excluded in those cases of tuberculosis with congenital atresia of the vagina.

The prophylaxis of genital tuberculosis consists as in phthisis of increasing the resisting power of the body, excluding the danger of infection and ameliorating the predisposing factors (gonorrhœa, puerperium).

The urinary apparatus of the female is less often involved in tuberculosis than is the genital apparatus. Most frequently the kidney is the affected organ; then follows the bladder, then the ureter, very seldom the urethra. According to Casper, tuberculosis of the urinary apparatus is a symptom of a general tuberculosis, and is usually descending in its mode of extension. The infection of the urinary tract by tuberculosis of the genitalia must be very infrequent; no cases are on record. Also, the infection of the genitalia from the urinary tract is very improbable. Martin believes 2 per cent. of diseases of the female genitalia are of a tuberculous nature. There is a primary form of the disease, although the secondary is much more frequent. The infection sometimes travels upward from the vulva, and this may be styled the ascending form of infection. Chronic inflammatory disease (gonorrhœal, syphilitic, puerperal) and malformations of the genitalia predispose to tuberculosis. There are no pathognomonic symptoms. If the process is confined to the genitalia, or if the genital involvement threatens life, the organs should be entirely extirpated. Veit mentions as palliative local treatment the use of iodoform. He believes there are two forms of tuberculous peritonitis—an ascitic and an adhesive form. Peritoneal affection with widespread nodular formations, in the absence of ovarian tumors and carcinoma, may be safely looked upon as tuberculous. A generally accepted theory for the healing which sometimes occurs in peritoneal tuberculosis after simple laparotomy does not exist. Fargas believes with Veit that the healing is in nowise due to the laparotomy, but results from the formation of a resisting body serum. Theilhaber mentions a plausible theory in regard to the beneficent effect of exploratory laparotomy upon peritoneal tuberculosis. The ascites in such cases is due to a stenosis of the portal system of veins from the pressure exerted by adhesions and an infiltrated mesentery. In an exploratory laparotomy the ascitic fluid is evacuated and the old adhesions are broken up. The laparotomy also occasions, as Max Jaffe and others have shown, broad areas of adhesions between the mesentery and the belly walls. In this way a new collateral circulation is formed and the ascites is relieved. With this comes an improvement in the appetite and digestion, and an increase in the general strength, which sometimes is sufficient to arrest the disease. If this theory is correct, then colpotomy should never be employed. After opening the abdomen the old adhesions should be thoroughly divided

and an attempt to cause the formation of new ones should be made. The omentum might even be stitched to the belly wall after the manner of Talma for cirrhosis of the liver. Gottschalk believes that there may be another explanation besides the hæmatogenous one for primary genital tuberculosis. It has been recently shown that the spermatozoa of a tuberculous subject may contain virulent bacilli without any especial manifestations of the disease in the genital organs. Furthermore, Boveri has shown it to be in the highest degree probable that the ovum does not come from the germinal epithelium, but that soon after an ovum is impregnated in its earliest division a special sexual cell is separated which subsequently is further divided and gives rise to the daughter ova. If the impregnating spermatic particle is tuberculous the primary sexual cells and the daughter ova might also be diseased and thus infect the ovary. Although it is manifestly almost impossible to clinically substantiate this theory, Gottschalk believes it should be taken into consideration. In regard to primary genital tuberculosis of the adult, Gottschalk says that if it is impossible to prove under such conditions that it is even primary, then it is impossible to regard a total extirpation of the diseased genitalia as a radical measure. He would be inclined to regard as correct a diagnosis of primary tuberculosis if from the history and long clinical observation no other seats of the affection were discovered, and if after total extirpation of the genitalia the patient were permanently cured.

Symptoms. These are variable and not characteristic. Some patients complain of amenorrhœa, others have hemorrhage; in most the menses are regular. Mucous, mucosanguineous, and mucopurulent discharge may be present. Individual patients may complain of headache, languor, drawing and stabbing pains in the lower abdomen, dull pains at the site of the uterus, and colicky pain in the abdomen, which radiates to the loins or thighs. In tuberculosis of the vulva and introitus there is frequently hemorrhage upon coitus or active motion, and painful urination. In some very severe cases of tuberculosis there is no pain whatever. Fever may or may not be present.

Tuberculosis of the Vulva and Vagina. Gebhard says in his *Text-book on Gynecological Pathology* that the vaginal affection is extremely seldom and that vulvar tuberculosis occurs with the greatest rarity. Tuberculosis of the vulva appears, according to Stolper, in the form of ulcers or as lupus. In the first variety the appearance may be typical of tuberculosis or its diagnosis may be very obscure. It is the same with lupus. Sometimes besides the ulcerations we find fistulæ and polypoid outgrowths, which, in the absence of caseation and characteristic nodes, are difficult to diagnose. The affection of the introitus usually described as *ulcus rodens* is very often of tuberculous origin, as the cases of Rieck, Bierfreund, and R. Freund show.

More frequent than vulvar is vaginal tuberculosis, although it is usually associated with tuberculosis of other parts of the genital apparatus. The primary form here is very rare. There is only one case, that of Bierfreund, so far known. Tuberculosis of the vagina, according to Williams, is usually located in the posterior vaginal fornix.

Portio and Cervix Tuberculosis. The portio as well as the cervix may be the seat of both primary and secondary tuberculosis. The affection here, however, is much less frequent than in the corpus uteri. Vassmer believes this is due to the thick epithelial layer of the portio and the tenacious cervical mucus which protects this part. The affection may either remain localized or spread to the uterus. Its progress is usually arrested at the internal os. Tuberculosis of the portio and cervix is of especial import, because it may sometimes be confounded with carcinoma and other new-growths. Alterthum has reported a case in which there was not only proliferation and metaplasia of the surface and glandular epithelium, but also in some areas an onion-like, concentric arrangement of the cells, as in cancer pearls. Fränkel distinguishes three forms of cervical tuberculosis: 1. Miliary. 2. Diffuse caseous infiltration. 3. A chronic form beginning with induration and leading to fibrous thickening and caseation.

According to Kauffman, the affection, when localized in the cervical canal, shows more destructive tendencies; upon the portio it presents fungosities and papillary outgrowths—a cauliflower-like growth.

Vassmer describes four forms of cervix and portio tuberculosis:

1. Tuberculous new-formation (papillary).
2. The flat ulcer.
3. Miliary tuberculosis.
4. The tuberculous catarrh.

Tuberculosis of the Corpus Uteri. This is more frequent than any of the forms so far described, although less frequent than tubal tuberculosis. It is very seldom primary; usually it is from the extension of a tubal process. On this account the fundus at the tubal angles is the area most often involved. The infrequency with which the uterus is thus diseased as compared with the tubes is attributed by Stolper to the resistance which the endometrium offers by its monthly progressive and regressive changes. This view is substantiated by the fact that in childhood and after the climacterium, or when from any other reason amenorrhœa exists, the uterus is much more frequently diseased. As Sippel observed, the folds of the tubal mucosa afford a much securer resting-place for tubercle bacilli than does the smooth mucosa of the uterus, subject to menstrual changes and covered by the secretions of its glands. With respect to the pathological anatomy of the uterine tuberculosis, Walther divides the process into three stages:

1. Miliary tubercle formation.
2. Ulcerating stage.
3. Pyometra.

Stolper accepts this classification, but remarks that they are all many times found associated together.

The size, shape, color, and consistency of the tuberculous uterus may be entirely normal. The mucosa may be so little altered to the naked eye that no suspicion of tuberculosis would be entertained. In other cases the uterus is considerably enlarged in consequence of metritis or because the caseous masses have distended it or have excited hyperplasia.

The epithelium may be well preserved, partially preserved, degenerated, or totally absent. The glands early show hypertrophic or atrophic changes; their epithelium is usually preserved, shows often papillary proliferation, often becomes cubical, and shows vacuole formation. In later stages the epithelium of the superficial glands entirely degenerates, or it may change into epithelioid cells. The interstitial tissue is hyperplastic, infiltrated with round cells, with here and there giant cells. In areas where the tuberculous process is marked the glands are almost entirely absent, the mucosa is thinned, and the picture is more that of an interstitial type of endometritis. Well-marked tubercles may or may not be present. In the severest cases the mucosa is entirely replaced by granulation tissue. The tuberculous process in its further course invades the muscular coat of the uterus; this may be almost entirely degenerated, so that the organ simply consists of a fibromuscular bag filled with purulent or caseous material. From degeneration of the mucosa complete obliteration of the endometrial cavity may occur.

Tuberculosis of the Tubes. Of all parts of the genital apparatus the tubes are the most frequent seats of tuberculosis. Either the ascending or the descending form may first develop here. The tubal mucosa seems especially favorable for the lodgement and growth of the tubercle bacilli. It is probable that an infection of the mucosa only occurs when it has been previously weakened by catarrh. The tubal disease is usually bilateral. An acute and a chronic form have been noted, but the acute form is without especial interest to the gynecologist, for the local changes are not marked and are entirely insignificant in view of the general condition.

In chronic tubal tuberculosis, on the other hand, the most extensive alterations in the tube occur. It is the form of genital tuberculosis which most habitually causes its subject pain and leads her to seek medical attention. The tuberculous character of the affection is difficult to recognize clinically, for the same symptoms and the same gross

changes may be produced by other forms of infection. For the most part, bearing out the frequency of the descending form, the abdominal part of the tube is first involved. The bacilli gain entrance here from the peritoneum, ovary, bowel, and the mesenteric lymph glands, either directly or through the lymph and blood channels.

In the ampullæ of the tube the greatest alterations in shape and in position occur. The organ often becomes adherent to adjacent organs in a knotty mass. If the tubal end is open pus and caseous masses may be discharged into the abdominal cavity, where they may produce tumor-like formations surrounded by a pseudomembrane. This pseudomembrane is either formed by the reaction of the peritoneum, etc., or the caseous and purulent material has been discharged into a cavity already walled off by adhesions. Usually the abdominal ostium is closed; the secretions collect in the tube, which enlarges to the size of a child's head. Nodes, also, are frequently formed in the isthmal and interstitial portions of the tube. The folds of the mucosa may unite with one another and thus lead to the formation of pseudoglandular and cystic spaces. The nodules often found in tuberculous salpingitis have been variously interpreted. Rokitansky, Foerster, Merkel, Simpson, and Klebs have taken them for small myomata. Chiari believes they are due to hypertrophy and hyperplasia of the musculature of the tube. The cystic spaces in these nodes have been described by Martin, Orthmann, and Werth, who believe they are due to invaginations of the mucosa. These nodes undoubtedly may be of several types, but it is certain that most of them arise from an inflammatory condition. Schauta believes that because of the narrowness of the tubal lumen at the isthmal part the inflamed and swollen mucosa projects into the muscular layer and causes hypertrophy.

Tuberculosis of the Ovary. This was formerly so seldom observed that Virchow said there was almost no such thing as tuberculosis of the ovary. Von Winckel, Birch-Hirschfeld, and Olshausen also emphasized this statement. Guillemin attributed the resistance of the ovary to its isolation, and not being in direct communication with the outer world and to its histological structure. Orthmann could find in a complete review of the literature 177 cases of ovarian tuberculosis, but in only 57 of these had the diagnosis been verified by a histological examination. Whether primary ovarian tuberculosis ever occurs is questionable, and Griffith, Orthmann, Schottländer, and Stolper agree that no indisputable case has ever been reported. How the tubercle bacilli gain entrance to the ovary is questionable. First must be considered the peritoneum. Peritoneal tuberculosis frequently spreads to the ovary. B. Wolff believes that this always occurs if the ovary has not been protected through adhesions. According to this

author, the disease is often non-recognizable macroscopically, and some cases are overlooked. Mosler, Klebs, and Guillemain believe the ovary is often infected through the blood channels. A hæmatogenous infection is possible especially in acute miliary tuberculosis of the lung. The mode of infection, however, usually appears to be by contiguity from the peritoneum or through the lymphatics. In the beginning there are scattered tubercles in the ovarian tissue which later become caseous. In advanced cases abscesses or caseous collection may include nearly the entire organ.

Urogenital Tuberculosis. The urinary organs in woman are more distinct from the sexual apparatus than those of the male. This, perhaps, explains the less frequent involvement of the urinary organs of the female in tuberculosis.

Pregnancy and Tuberculosis. Tuberculosis may occasion abortion or premature labor in the course of pregnancy. The disease usually takes renewed growth during pregnancy and the puerperium, or a latent tuberculosis may first develop during these periods. A tuberculous placenta may be the starting-point of an acute miliary tuberculosis. Tuberculosis may be the cause of tubal pregnancy.

Giant and Epithelioid Cells. There is much that is not yet clear as to the genesis of the Langhan giant cells and the epithelioid cells commonly taken in the histological examination for indications of tuberculosis. It is likely that both originate from various sources. It is known that the giant cells may originate from surface and from glandular epithelium, from stroma cells, and from the endothelium of the smaller vessels. Von Franque, Bierfreund, Hofbauer, Brosch, Cornil, Ranvier, and Schottländer have studied this question. The latter found that degenerated ova, whose granulosa cells were not well preserved, might be mistaken for giant cells, and Jacobsohn and Buhl have observed that not all giant cells found in granulation tissue are tuberculous. Michaelis believes the epithelioid cells to be derived from the stroma.

Diagnosis of Tuberculosis. The diagnosis is often extremely difficult because there are no symptoms characteristic of the affection. Most of the cases described in the literature have been diagnosed at the operation or after it or at the autopsy. Nevertheless, every circumstance that might indicate the nature of the illness should be borne in mind. The history may furnish important data. If from this we learn that the patient earlier in life suffered from scrofula, from glandular, osseous, or interstitial tuberculosis; if their parents or children have been the subjects of this disease; if upon physical examination there are evidences of previous tuberculosis—cicatrices in the lungs, pleural thickenings; cicatrices about the lymphatic glands, bones, or joints—chronic aural suppuration, open fistulæ, and general nutritive disturb-

ances, phthisical habit, scanty subcutaneous fat, weak musculature, anæmia, headache, etc., we must, in the presence of pelvic pain and anatomical alterations of the genitalia, bear in mind tuberculosis.

Tuberculosis of the visible parts of the genitalia may present a characteristic appearance—an ulcer the size of a lentil, with poppyseed-like yellowish-gray tubercles on its border, which quickly undergo degeneration. But here, as in many other diagnoses, the microscope is the court of appeal. There are numberless cases where the histological examination alone of parts removed at operation has given a clue to their real nature. The recognition of tubercle bacilli themselves afford the best proof of the nature of the disease, but the many difficulties in the technique of their demonstration has led to the acceptance of the typical tubercles, giant and epithelioid cells, as a sufficient indication. Tuberculous nodules on the peritoneum of the structures in relation with Douglas' cul-de-sac may sometimes be recognized by palpation through the bowel or vagina. Such nodules, however, are by no means peculiar to tuberculosis, and may be due to metastases from sarcoma, carcinoma, or papillary ovarian cysts, and to small myomata or inflammatory thickenings. Such nodules, however, are commonly less diffuse, and the small hard ones are usually due to tuberculosis. Frees and Gusserow have both had cases supposed at operation to be diffuse peritoneal tuberculosis, which proved to be minute fibromata. Frees notes another case of carcinoma which resembled very closely peritoneal tuberculosis. The diagnosis of tuberculosis from the presence of giant cells in granulation tissue Rieck and Veit consider questionable. Besides the typical tubercle as described by Virchow, Schmorl lays stress upon the preservation of the bloodvessels. The latter in tuberculosis are well preserved, while in syphilitic processes they almost invariably show some changes. Voight believes many cases of post-partum genital tuberculosis are mistaken for puerperal fever.

Prognosis of Genital Tuberculosis. The prognosis of genital tuberculosis is always grave. In secondary forms it is influenced more by the primary lesion than by the genital involvement itself. Primary tuberculosis as elsewhere may undergo healing or it may become latent. Williams believes the former never occurs in the genitalia. Intercurrent diseases, as influenza, can excite the latent form into renewed activity. The gravity of the prognosis depends upon the parts involved. Tubal tuberculosis, on account of the danger of peritoneal infection, adhesions, etc., gives the worst prognosis. Pregnancy makes the case more serious, because the infection has more chance to spread in the hyperplastic, softened tissues. Casper has reported a case of rupture of the uterus from this source. Hegar says that besides its general effect in stunting development the genitalia may be especially

affected, and records three cases where the uterus was of the infantile type. In two of these the patient had never menstruated, although past the age of puberty.

Treatment of Genital Tuberculosis. There is no doubt that genital tuberculosis sometimes undergoes spontaneous cure. Relative to the treatment stands the question as to whether the disease is primary or secondary. In the secondary forms one may only treat the genital lesions after a careful study of the more vital organs that are involved. Alterthum would further differentiate in the treatment between acute tuberculosis, long-standing cases, and very old forms.

In the acute cases he would defer operation until sure that suitable dietetic and therapeutic measures gave no relief. The second class of cases, those that have existed for some time and not amenable to palliative measures, are the ones most adapted to operative interference.

In the old, indolent forms operation would better be avoided. The pain in these latter cases is usually not caused by the disease itself, but more from cicatricial contractions that have occurred around blood-vessels and nerves.

For tuberculous ulcers of the vulva and vagina the best treatment is thorough excision by the curette and cautery. In tuberculosis of the cervix Frank, from his experience, advises hysterectomy rather than high amputation. On the other hand, Aron and Pillaud have seen the development of general tuberculosis following this radical measure.

In the treatment of uterine tuberculosis authorities disagree. Walther, Hegar, Williams, Meyer, Michaelis, and Sipple favor thorough curettage followed by iodoform. Vassmer questions whether this procedure can lead to cure, and Döderlein, Schauta, Pozzi, and Fehling look upon it only as a palliative measure. Nevertheless, Sippel, Walther, and Halbertsma have reported cures by this method. When the tubes are involved most authors agree upon operation. The diseased tubes must be removed, for they are a menace to the peritoneum and adjacent structures, and produce grievous pain. Coincident phthisis contraindicates any operation upon the genitalia except the suffering is very great. The results of operation in such cases are unfavorable, perhaps from the influence of the anæsthetic, perhaps from the loss of blood.

In the operation Sippel advises where possible to leave the ovaries or a portion of them.

Stratz gives as indications for operation :

1. When the tube is not fixed and the diagnosis is clinically and microscopically assured.
2. In chronic tuberculosis with adhesions and recurrent circumscribed peritonitis.

The operation is contraindicated when vital organs are seriously involved. Alterthum believes that cœliotomy should be chosen in preference to colpotomy.

Sellheim¹ says that tuberculosis of the genitalia is often indicated by its presence in other organs or in individuals living with the patient. Subjects with many abnormalities of development are often tuberculous. A very marked rosary-like form of the tube, especially when very hard, is frequent in tuberculous disease. The presence of nodes in the pars keratina uteri is a good sign of the tuberculous affection. The microscopic examination of the uterine mucosa, the peritoneum, and the tube is always necessary for positive conclusions. Sellheim reports 65 cases which have been treated in the last eight years in the Freiburg Gynecological Clinic. In 28 cases palliative treatment was employed, and the result so far as a diminution of pain, ability to work, and a relative cure of the affected organs was most gratifying. In 37 cases operative measures were employed with equally good results. The operation had best be radical with a complete removal of the diseased adnexa and uterus. In the discussion upon Sellheim's paper von Rosthorn declared that he relied greatly for the diagnosis upon the history and the existence elsewhere in the body of tuberculous affections. Palpation he believes can only inform us of gross conditions in the pelvic organs. Neither the rosary form of tube, salpingitis isthmica nodosa, nor the oft-cited nodes of Hegar in Douglas' cul-de-sac were of any diagnostic value. Also, as is well known, the bacteriological examination of the uterine secretions is by no means reliable. The difficulty, then, of recognizing tuberculosis clinically is often very great, but when the diagnosis is certain he is in full accord with the school of Hegar, that radical measures should be employed in order to prevent the spread of the disease. Tuberculosis has been cured by simply opening the belly cavity, but there is no assurance of this good result, and it is far better to remove at once the affected organ.

Ahlefelder² reports 13 cases of tuberculosis with his deductions relative to diagnosis and treatment.

Stolper found the genitalia affected in 20.6 per cent. of 34 cases dying of tuberculosis. Turner gives a percentage of 18.5. In 300 gynecological cases Stratz found 7.3 per cent. of genital tuberculosis. Ahlefelder's statistics show 13 cases out of 649, a percentage of 2.01. The disease is found at all ages. In this series of cases the age of the

¹ Diagnose und Behandlung der genital Tuberculose; von der Versammlung Deutscher Naturforscher und Aerzte in Karlsbad. Central f. Gynäk., No. 43, 1902.

² Klinische und Anatomische Beiträge zur Genital tuberculose des Weibes. Monats. f. Geburt. und Gynäk., Band xvi., Heft 3.

patients varied between nineteen and fifty, but Stolper reports a case at the age of nine and one-half months, and Amann observed the condition in an eleven-year-old girl. Nevertheless, the affection is usually found during the procreative period of life. Of Ahlefelder's patients 9 were married, 2 were virgins, 2 were not virgins; 4 of the married ones were sterile. The others had borne children from six to twenty-three years before they came under observation. The author believes the disease quickly causes sterility through early involvement of the tubes. But one of the cases reported gave any hereditary history of tuberculosis. The sister of a girl, aged twenty-one years, had died of phthisis. In only 4 of Ahlefelder's cases was the diagnosis established before operation, and in 3 of these there was coincident tuberculous affection of other organs. The configuration of the tubes and peritoneal nodes, valued by some as diagnostic factors, were of no assistance in his cases. With respect to the operative treatment, laparotomy was performed five times; colpotomy, with resection of the diseased parts, five times, and total vaginal extirpation three times. Three deaths occurred within four weeks of the operation from associated tuberculosis of other organs; so that the author believes operation should not be considered when advanced tuberculosis exists elsewhere in the body. The other patients bore the operation well, and, with one exception, had a perfect convalescence. From five of these the author has heard recently, and they are all in good health.

Tuberculosis of the Genitalia in Female Children. Brüning¹ reports 44 cases of genital tuberculosis occurring in female children. The age of the cases was as follows:

	Cases.	Per cent.
Before the age of one year	1	2.3
Between the ages of one and five years	20	45.5
" " six and ten "	8	18.9
" " eleven and fifteen years	15	36.4

We may surmise from this that tuberculosis of the genitalia in the child usually manifests itself before the fifth year.

With respect to the parts affected, Brüning found the disease localized to the:

	Cases.	Per cent.
Tubes, unilateral in	29	65.9
Tubes, bilateral in	26	59.1
Uterus	24	54.5
Ovaries	12	27.2
Vagina	5	11.4
Vulva	1	2.3
Labia and clitoris	2	4.6

¹ Tuberkulose der Weiblichen Geschlechtsorgane im Kindesalter. Monats. f. Geburts. und Gynäk., Bd. xvi., Heft 2.

In this series of cases the diagnosis was made during life in but 8 (18.2 per cent.) of the patients; in 36 the post-mortem revealed the tuberculous affection.

Besides the 36 deaths indicated 2 children died with tuberculous ulcerations of the perineum and vagina. For the most part, the autopsies revealed general tuberculosis, and the genital condition was observed merely as an associated condition. Of 44 cases, therefore, 38 (86.7 per cent.) died. In the remaining 6, operative interference produced a cure or the disease disappeared spontaneously.

In the cases of Küttner, Schenk, and Karajan the tuberculous parts with their neighboring lymph glands were extirpated. In one case of Vierordt's an exploratory laparotomy checked a tuberculous peritonitis permanently.

The therapy in these cases of tuberculosis consists almost exclusively of measures to improve the general condition of the patient. Operation can only exceptionally be employed, as in those cases where the disease affects the external genitalia.

DISEASES OF THE BLOOD AND DUCTLESS GLANDS. THE HEMORRHAGIC DISEASES. METABOLIC DISEASES.

By ALFRED STENGEL, M.D.

THE BLOOD.

Eosinophilia. The importance of increase of the eosinophilic cells has long been the object of discussion. Particular attention has been directed to the subject by Neusser and his pupils, who believe that the supply of the eosinophile cells in the blood is under the control of the sympathetic system, and that eosinophilia is an evidence of sympathetic irritation. This irritation may proceed from the organs of generation, skin, intestines, etc., and in the various disorders of these parts of the body an increase in the cells with acid staining granules has been found in the blood. The diagnostic importance attributed to the increase of the eosinophiles by Neusser has not been verified to any great extent by subsequent observers. It seems, however, an established fact that invasion of certain parasites is accompanied by a marked increase in the eosinophilic cells, and, in conditions as *trichiniasis*, this increase in conjunction with other clinical evidences may be of great diagnostic value. Recently Gulland¹ has reported a case of *filariasis* in which the eosinophiles were increased, and he noted that the increase was most marked in the evening, when the blood contained numerous embryos. The percentage of eosinophilic cells varied from 3 per cent. in the morning to 12 per cent. in the evening. The number of red cells and the proportion of the other forms of leucocytes remained unchanged, though the total number of leucocytes was slightly increased at the evening count. Coles² found a similar increase in eosinophiles in two cases of *filariasis* (17 per cent. and 15 per cent.), and reports a case infected with *Bilharzia hæmatobium* in which the eosinophiles amounted to 20 per cent. Russell³ confirms this finding in regard to eosinophilic increase in *bilharzia* disease. In his patient, a man, aged twenty-five years, invalided back to England after service in the South African War, typical ova were present in the urine, and three examinations of

¹ British Medical Journal, April 5, 1902.

² Ibid., May 10, 1902.

³ Lancet, December 6, 1902.

the blood showed a percentage of eosinophiles of 33.6 per cent., 31.8 per cent., and 23.8 per cent., respectively.

Some time ago attention was called to eosinophilic increase in hydatid cyst of the liver, it being claimed that this was the only abdominal tumor in which these cells were found to be increased. The case of Seligman and Dudgeon¹ seems to verify this statement. The patient was a woman, aged twenty-two years, who suffered from a *hydatid cyst of the liver*. The blood examination showed the red cells to be over 6,000,000, the white cells 17,000, and the hæmoglobin 70 per cent. The differential count of the leucocytes showed the polymorphoneutrophiles to be 22 per cent., the eosinophiles 57 per cent., the lymphocytes 22 per cent., and the basophiles 1 per cent. After evacuation of the cyst by operation the number of the eosinophiles rapidly dropped to normal.

Very few reports as to the condition of the eosinophiles in *bothriocephalus* invasion have been published. Schumann, in 1894, states that he found a slight increase in the eosinophile cells. More recently Bendix² has reported a case of *bothriocephalus* anæmia in a boy aged five years. The differential leucocytic count in this case showed the polymorphoneutrophiles to be 40 per cent., the eosinophiles 8 per cent., and the lymphocytes 52 per cent. In this case both lymphocytes and eosinophile cells were increased. Wilson,³ in his case of *bothriocephalus* anæmia, reports a leucocytosis, but makes no statement as to the differential count.

Besides these forms of parasitic eosinophilia the condition has been found in cases infested with *oxyuris*, *ascaris*, *anchylostoma*, and the *tænia saginata*, and in most of these cases eosinophile cells and Charcot-Leyden crystals are abundant in the feces. Thus practically all the larger parasites infesting man—with the exception of the *tænia solium*, concerning which no reports have been met with—show a distinct eosinophilia. The increase of these cells under such circumstances deserve study, as any aid to the diagnosis of such obscure conditions as hydatid disease and trichiniasis will be welcome. The occurrence of eosinophilia in many diseases of the skin is well known, being especially marked in *pemphigus*. Hoffmann⁴ has observed a peculiar form of dermatitis occurring suddenly in a syphilitic after prolonged use of mercury, in which along with a leucocytosis there was a marked eosinophilia, reaching 49 per cent. in one instance.

¹ Lancet, June 21, 1902.

² Verein f. innere med. in Berlin, June 16, 1902.

³ American Journal of the Medical Sciences, August, 1902.

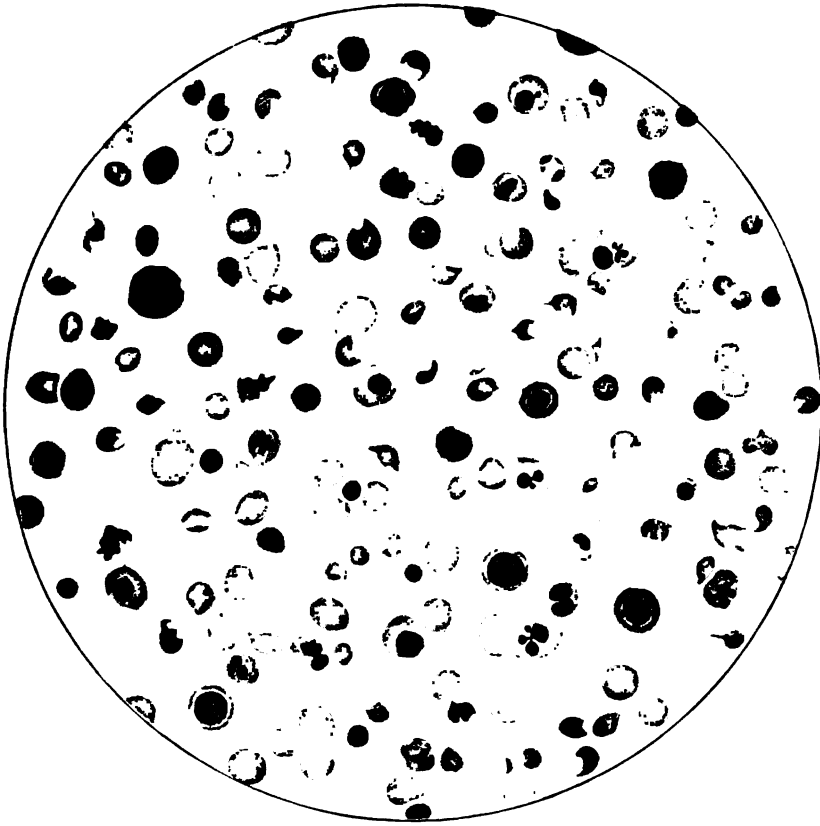
⁴ Berliner klin. Wochenschrift, 1902, Nos. 39 and 40.

PLATE I.



Blood in a case of chronic acetanilid poisoning. Photomicrograph of an average field.

PLATE II.



Blood in a case of chronic acetanilid poisoning. Composite drawing showing the degenerations of the red corpuscles and the different types of erythroblasts.

He calls attention to the fact that besides the general leucocytosis existing in such medicinal dermatitis there is a very marked increase in the eosinophiles. There is likewise a local increase of the eosinophiles in the skin lesion.

Blood-poisons. A study of the various poisons capable of bringing about degeneration of the blood, and particularly those of the benzol group, is of great importance. The innumerable patent remedies for headaches, insomnia, etc., so freely advertised in this country, practically all contain some form of coal-tar derivative, and owing to the laxity of our laws in this respect can be obtained in any desired quantity by the laity. Besides this the use of aniline has become so great in the many departments of manufacture that each year a larger number of people is exposed to its influence. A case illustrating the deleterious effect of the use of *acetanilid* when continued over a long period of time has recently come under the writer's observation.¹ The patient, a young woman, aged twenty-five years, was admitted to Dr. Cryer's service, University Hospital, January 19, 1902, on account of a dental neuralgia which had existed for four years. She was so extremely cyanosed that she was transferred to my service for medical treatment. The previous history was practically negative. A year previous to the onset of the neuralgia she had had an attack of malaria lasting six weeks, and after this she had marked anæmia and first noticed a tendency to cyanosis. For three years she had had more or less marked œdema. The cyanosis likewise varied in intensity; at times she had been entirely free from it. Questioned as to drugs she stated that for insomnia arising from the dental pain she had been given chloral and other remedies, but was uncertain if sulphonal had been administered. On examination the most striking feature was the marked cyanosis, the skin being lead-colored, while the nails of the fingers and toes were almost black. The face was covered with an acne eruption, and there were rings of pigment around the eyes. The patient was thin, but showed no evidence of œdema. The heart was enlarged to the right and left; its action was weak and rapid, while over the entire precordia could be heard a systolic murmur which was transmitted to the left and to the back. Both second sounds were accentuated and a thrill could be felt in the neck. The liver was slightly enlarged, and the spleen decidedly so, reaching two inches below the ribs. It was not tender. In spite of the extreme cyanosis there was no dyspnoea, coldness or œdema, and it was evident that there was present some form of blood-poisoning or an abnormal commingling of arterial and venous blood. She was at once bled, with some relief to the cyanosis, which

¹ Stengel and White, University of Pennsylvania Medical Bulletin, February, 1903.

by the next day had disappeared. At the same time the heart dulness had diminished, especially on the right side, and the murmur was less marked. The blood examination showed 3,040,000 red cells and 19,800 white cells. No abnormality was at this time noted in the appearance of the corpuscles. The urine, however, was claret-colored; contained considerable albumin, but no sugar. Under the microscope numerous phosphate and oxylate crystals were seen, along with some epithelial cells and a few dark and light granular casts. Unfortunately, it was impossible to have the urine examined for hæmatoporphyrin at this time. The next blood examination (February 10th) confirmed the suspicion of the existence of some form of hæmolytic poison. The red cells numbered 2,092,300; nucleated cells, 71,400; hæmoglobin, 35 per cent. The latter estimation was difficult and doubtful. The nucleated cells were at first thought to indicate leucocytosis only, but the stained specimen showed that 32,323 were nucleated red cells. The red corpuscles were markedly irregular in size, many cells being much above the average and others minute microcytes. Fragmented forms were very frequent, and many of the cells had lost their biconcavity. Shadow forms were found in some abundance, and all intermediary stages between normal cells and distinct shadows with but a rim of faintly staining protoplasm. Very few granular (basic) degenerative cells were found. Polychromatophilic cells were conspicuous, and the blood-plaques increased in number. The most striking feature, however, at this time was the presence of abundant nucleated red blood-corpuscles, erythroblasts, and free nuclei. Normoblasts preponderated, but there were considerable numbers of megaloblasts. Karyokinetic figures were found in many of the erythroblasts. The differential count of the cells, white and red, showed: polymorphonuclear, 72.4 per cent.; large mononuclear, 5.4 per cent.; transitional, 6.6 per cent.; lymphocytes, 11.4 per cent.; eosinophiles, 0.8 per cent.; myelocytes, 3.4 per cent. Of the nucleated reds the normoblasts were 91.4 per cent.; megaloblasts, 3.2 per cent.; free nuclei, 5.3 per cent.

A letter to the patient's brother, a physician, stating the belief that there was some form of drug intoxication, probably phenacetin or acetanilid, met with a prompt denial. He was certain that the cyanosis was not due to a drug, and while he had not examined her heart several other physicians had done so. One suggested mediastinal tumor, and another a tear of the ventricular septum. Careful watch was kept over the patient, but nothing suspicious could be discovered until March 24th. In the meantime the condition had greatly improved, and Dr. Cryer had operated successfully for the neuralgia. The chemical examination of the blood and urine made at this time showed hæmoglobin,

but no hæmatoporphyrin or methæmoglobin. On March 24th an express package containing compound acetanilid capsules (acetanilid, 3 grains ; caffeine, $\frac{1}{2}$ grain ; soda bicarbonate, $2\frac{1}{2}$ grains) was discovered. The patient finally confessed that she had taken these capsules almost continuously while in the hospital, using at times as many as fifteen or twenty a day. She further admitted that she had been taking these capsules for the last four or five years in large quantities, and previous to that she had used antikamnia and other forms of antipyretic anodynes. She insisted, however, that her first attack of blueness occurred while she was still at school, and before she had ever taken remedies of this sort. On withdrawal of the drug her return to normal was rapid, and on March 30th the blood was practically normal. The heart had regained its normal size, the murmur disappeared, and the acne eruption was practically gone.

The blood findings in this case are practically the same as those met with by Mohr¹ in a series of cases of poisoning with *benzol compounds* occurring in workmen employed in the chemical works at Frankfurt. He reports 10 cases in all, and gives notes on 6 of them. Of the 6 cases given in detail the longest period of employment was four weeks, and the shortest period eight days. In 2 cases the onset was apparently brought on by indulgence in alcohol, in which the benzol is soluble, and so favors absorption. In his cases he calls attention to the occurrence of reddish granules in the otherwise pale erythrocytes. This is the "hæmoglobinæmic degeneration" of Ehrlich. In all of his cases the blood was brownish or chocolate in color, and showed the presence of methæmoglobin, and in all cases examined hæmatoporphyrin was found in the urine. As a rule, the first symptoms are headache and dizziness, or, in severe cases, there may be unconsciousness with signs of collapse. The extremities are cool, pulse rapid and small, respiration hurried and superficial. There may be muscular tremors with loss of reflexes. The fundamental cause is the changing of the normal coloring matter of the blood into methæmoglobin. From this results the peculiar color to which is sometimes added a yellowish tinge as a consequence of red cell destruction. In those working in the reduction room a bluish color is most in evidence, while in those working in the nitrite departments a yellowish hue predominates. The important blood changes to be noted are the marked increase in the nucleated red cells, together with the finer changes in the erythrocytes, such as have already been mentioned ; the excess of the blood-plaques, and a leucocytosis affecting as a rule the polymorphonuclear neutrophiles. (This was not present in our case.)

¹ Deutsche med. Wochenschrift, January 30, 1902.

The case reported by Cabot¹ is somewhat exceptional. This patient was a man, aged thirty-five years, who, on account of pain in the head, had taken about thirty grains of acetanilid daily for six months before he came under observation. A month previous to his admission to the hospital blueness first appeared, and since then had persisted. The patient's skin was of a yellowish, livid color, and the lips, tongue, mucous membrane, and nails even of a slaty hue. He was well nourished and had no dyspnoea. Physical examination was negative (except for a polyp in the nose which proved to be cancerous). The blood was chocolate-colored. The red cells numbered 5,200,000; white cells, 16,000; hæmoglobin could not be determined. The leucocytes were: polymorphonuclear, 92 per cent.; lymphocytes, 8 per cent.; eosinophiles absent. In the stained specimen no abnormality of the red cells was noted except a granular stippling of many, and slight poikilocytosis. The urine was brownish in color, and both it and the blood showed the methæmoglobin spectrum. Hæmatoporphyrin was not found in the urine. The difference in susceptibility to the action of acetanilid and similar compounds is well known, and probably explains the apparently slight action of the very large amount of the drug. The lack of subjective symptoms in a patient with methæmoglobinuria which Cabot comments upon is not surprising in an individual with so large a number of red cells. The blood-count after three days omission of the drug was 6,200,000—a number so far above the average that a destruction of a million would still leave the normal amount. One more case may be briefly mentioned as illustrating one of the many ways in which *aniline poisoning* can occur. Rindfleisch² reports a patient whose aniline intoxication was produced by wearing felt shoes dyed brown with old aniline oil. This had been applied both inside and outside, and the absorption brought on an acute attack of poisoning.

Blood in High Altitudes. It has long been known that the passage from a lower to a higher altitude was accompanied by increase in the hæmoglobin percentage as well as in the number of red cells. Various authors have described the occurrence in animals (used for experimentation) of nucleated red cells, in addition to the above-mentioned changes. These studies are important, for the great improvement brought about in many diseased conditions by a sojourn in the mountains is a well-recognized clinical fact, but the nature of the changes that lie at the bottom of this improvement is still undiscovered. Two theories are advanced: the one maintaining that the increased number of cells is purely relative, and brought about by unequal division of the blood;

¹ Philadelphia Medical Journal, November 29, 1902.

² Verein f. wissenschaft. Heilkund, Königsberg, April 7, 1902.

the other theory holds that under the new conditions there is an increased manufacture of cells. The recent work along this line has increased our knowledge to a considerable extent without fully deciding the question. Campbell and Hoagland,¹ experimenting with Belgian hares, found a progressive increase in the number of corpuscles as the altitude became higher, and this increase continued during the three weeks they were on the mountains. They made a series of experiments in order to determine the exact cause of this increase. Packing the limb of a man in snow or placing it in a hot-air apparatus both produced local diminution in the count. Exercise of one limb alone produced local increase. They finally counted the blood taken from the peripheral circulation of a rabbit and compared it with blood taken from the mesentery. When this was done at a high altitude they found the latter gave a much lower count than the former. They concluded that the increase was due to a changed vasomotor condition in the peripheral vessels, resulting in dilatation of the arteries and peripheral stasis. The hæmoglobin was not increased to the same extent as the corpuscles. A similar conclusion was reached by Jaquet² as to the cause of the increase, but he thinks this increase is actual. After exposing a young rabbit to a temperature of 2° to 5° C. (36° to 42° F.) for six weeks the entire hæmoglobin was estimated after bleeding the animal and flushing its vessels with 1 per cent. solution in the Fleischl-Miescher apparatus. The result showed the same hæmoglobin per kilo of body weight in the exposed animal as in the control rabbit kept 13° to 16° C. (56° to 60° F.). He, therefore, concludes that the temperature has nothing to do with the changes noted in high altitudes. He next studied the effect of diminished air pressure, and placed the rabbits in an air-tight cage where, with sufficient aëration, they were kept at a constant pressure—640 mm. Animals kept under these conditions regularly showed an increase both in the number of cells and the hæmoglobin percentage. This diminution in pressure is the main factor concerned, and the temperature, excess of light, and the dryness of the air are not considered, for his rabbits were in a rather dark and moist cage, yet with lessening of the pressure the changes were noted in the blood. Abderhalden,³ while corroborating the findings of the others as to the increase in the cells and hæmoglobin in high altitudes, believes that this change is relative, and does not indicate a new formation of red cells. He believes with von Bunge, that going to a high altitude brings about a contraction of the vascular system, whereby the serum is pressed out, the number

¹ American Journal of the Medical Sciences, November, 1901.

² Archiv f. exper. Pathologie u. Pharmakologie, Band xiv. p. 1.

³ Zeitschrift f. Biologie, Band xliii. p. 125.

of red cells remaining unchanged, and thus a relative increase is produced.

While the mechanical factor (and peripheral dilatation seems to be the more plausible explanation) is probably the chief cause of this increase of cells, the fact that in so many individuals an increase of weight occurs on residence in the mountains would account for the formation of a certain number of new cells. The metabolism investigations carried out by Jaquet and Stähelm¹ seem to show that residence in the mountains is accompanied by a nitrogen retention that is greater than can be accounted for by the increase in blood alone, and that there must be also a new formation of other cells as well. My own view regarding this question has been expressed in previous numbers of *PROGRESSIVE MEDICINE* and elsewhere. It is substantiated by the investigation of Campbell and Hoagland and by Jacquet. Undoubtedly the rapid increase in the number of corpuscles found by pricking the finger or ear is due to centrifugation. Altitude, however, may have an additional stimulating influence on the organism, and more increase in weight through tissue growth may be caused by this.

The Leucocytes in Pregnancy, Parturition, and Puerperium. It is quite generally accepted that pregnancy is a physiological cause of increase in the leucocytes, this increase being especially marked in the latter months. The reports, however, have been rather few in number, so that the several papers appearing during the past year are especially welcome. The most important publication from the point of view of the number of cases examined is that of Zangemeister and Wagner,² and as some of their results are different from the usual beliefs it deserves special mention. All of their specimens of blood were taken from the ear, and the counts were made with a Reichert apparatus, the field being divided into nine spaces, as in the method of Breuer, already described. In order to establish the normal count they estimated the leucocytes in forty-seven healthy, non-pregnant women, varying in age from twenty-one to thirty-four years, who lived under the same conditions as to work, food, etc. The counts were made immediately before the noon or evening meals, and in this respect showed no differences. The last menstrual period was carefully ascertained in each case, as Landois has reported a physiological leucocytosis at this time. This seemed to have no effect in their cases, the count showing the same high worth a long time before as after. Of the 47 cases 3 had 4000 to 7500 white cells; 9, 7500 to 10,000; 19, 10,000 to 12,500; 12, 12,500 to 15,000, and 4 were over 15,000 (1 reaching 21,300). They

¹ *Archiv f. exper. Pathologie u. Pharmacologie*, Band xlv. p. 274.

² *Deutsche med. Wochenschrift*, 1902, No. 31.

conclude from this that strong working women living under like external conditions show marked individual differences in their leucocytes, while the variations in each individual appear to be slight. The authors state that they can give no explanation of the high average found, though they know that recent observers give a much lower count as the normal.

Counts were made on 57 pregnant women (90 estimations). Of these 2 cases in the eighth month (3 estimations) gave an average of 13,070 and 16,780 ; 12 cases in the ninth month (24 estimations) gave an average up to 10,000 in 3 ; between 10,000 and 12,500 in 4 ; between 12,500 and 15,000 in 3, and over 20,000 in 2 ; 43 cases in the tenth month (63 estimations) gave an average up to 10,000 in 14 ; between 10,000 and 12,500 in 13 ; between 12,500 and 15,000 in 11 ; between 15,000 and 17,500 in 4, and over 17,500 in 1 case. These counts show the same variations as in the non-pregnant women, and in both instances the majority of the cases showed a leucocyte worth between 7500 and 15,000. Repeated counts were made when the leucocytes were high, but the results were found to be practically constant, not exceeding 2000. In 2 cases the patients were put in bed, and four counts made daily in each for two days. The results were very constant ; even the effect of meal-time was relatively slight.

During Labor. Counts were made on 63 women during labor—one count each in 32 cases ; two counts in 31 ; three counts in 6 ; four counts in 2, and five counts in 2 cases. In all the patients except 2 there was a more or less marked increase in the white cells during labor, reaching its maximum at or shortly after the expulsion of the child. This increase was not dependent upon age, number of previous labors, constitution, or the physiological daily variation, but solely to the processes of the labor as such. Particularly high counts were met with in long labors, as in cases of narrow pelvis, or in short labors when the pains were excessive. When both these conditions were present the counts reached the maximum. Rupture of the membranes caused an increase.

Puerperium. Seventy-five cases were examined, with 249 estimations. In the normal puerperium in almost all cases a rapid fall of leucocytes was noted, cases with marked after-pains being exceptions. In two cases of artificial delivery (version with extraction, Cæsarean section) they were able to demonstrate an increase in the leucocytes. This, they think, points to the contraction and diminution in size of the uterus as a causal factor, for in a case of version without extraction no change in the white cells was noted, the increase appearing after expulsion. The introduction of a colpeurynter likewise caused an increase. The increase following Cæsarean section may in part be due to the

slight leucocytosis known to follow aseptic peritoneal incisions.¹ The effect of the ether is *nil* according to their experience.

As to pathological conditions complicating the puerperium their reports are meagre and not at all constant. A distinct increase in the white cells was noted in two cases of mastitis. Seven cases of more or less marked fever showed a moderate leucocytosis in two instances. A well-marked increase in the white cells was noted in their only case of severe infection which occurred after version and extraction in a case of placenta prævia. With a putrid lochial discharge the leucocytes showed no constant behavior; more frequently they remained unchanged. The authors are convinced that the only cause of a high leucocytic count in the puerperium is the presence of decomposed lochia in the presence of circumstances for the extensive absorption of the same. The putrid lochia alone usually caused no change in the white cells; even in cases where a slight infection must be assumed (chill with fever over 39.5° C.—103° F.) a leucocytosis was generally absent.

As a result of their investigations they conclude that no diagnostic or prognostic knowledge can be gained from the leucocytic count in puerperal fever. The fact that under physiological conditions at birth an increase of leucocytes can occur is of importance, as this increase has only been previously noted in infectious processes.

Senger² from ten cases personally examined confirms the findings of Zangemeister and Wagner as to the increase of leucocytes during labor, this increase being greater in primiparæ, which corresponds with the above author's statement that prolongation of labor favors leucocytosis. Senger found that the multinuclear cells were chiefly affected, and that there was a rapid diminution after labor, with a slight rise on the fifth or seventh day and again on the eleventh day. Hyperleucocytosis disappeared in normal cases on the fifteenth day. As to the cause of the increase of the leucocytes, Senger offers no explanation.

Pray³ believes that the increase is due to increased action of the enlarged lymphatic glands in the pelvis, and in part to increased metabolism, which causes a somewhat toxic condition. Its decrease is caused by the lochial discharge. As to the blood generally, Pray concludes, from his own twelve cases and a review of the literature, that where blood generation fails to keep pace with the increased vascular area a serous dilution of the blood takes place, but in the majority of cases this is not serious. Senger says that there may be anæmia but no leucocytosis in the first three months of pregnancy. During the remainder of pregnancy there is usually an increased number of red

¹ Wasserman, Münchener med. Wochenschrift, 1902.

² Yale Medical Journal, October, 1902.

³ American Gynecology, 1902.

cells and hæmoglobin content, as well as of the leucocytes. During the first ten days after labor there is usually a diminution of the red cells and of the hæmoglobin content, which after the second week may give way to a polycythæmia. The blood regeneration, according to Pray, is partly affected by the lessening of the vascular area after labor, and subsequent transudation of the fluids of the blood into the tissues.

The whole question needs investigation in order to reconcile some of these apparent discrepancies. The newer text-books¹ scarcely mention the subject. In this matter, as in the case of alterations of the blood at high altitudes, it seems to me the mechanical factors must be first considered. Undoubtedly, however, the peculiar nutritional conditions of the pregnant state warrant the suspicion that increased blood formation is also an important item.

Blood in Infectious Disease. A number of important articles have appeared within the past year concerning the behavior of the blood, and particularly the colorless elements, in infectious diseases. By arranging the findings of the various writers under the different diseases investigated a more satisfactory idea is obtained of the blood picture presented. As most of the infectious diseases occur in children, the points of difference between the blood in childhood and later life must be borne in mind. These differences were discussed in *PROGRESSIVE MEDICINE* last year, and consist chiefly in the much greater response to pathological conditions with a tendency to hyperleucocytosis and a marked increase in the lymphocytes.

MUMPS. The blood conditions in mumps are reported by Sacquépée.² The leucocytes are moderately increased, the increase affecting the mononuclear forms chiefly. With the advent of a complicating orchitis there is a marked increase of the polynuclear cells, which covers the increase of mononuclear elements, which, however, remain absolutely increased, though apparently diminished. This peculiar change in the blood picture is difficult to explain, and the possibilities suggested are that with the onset of the orchitis a more severe intoxication is manifested, a special reaction of the body to diseases of the testicle, or that the orchitis is due to a secondary infection. The increase of mononuclear cells in mumps is verified by Bezançon and Labbé.³ The small amount of literature published on this disease makes the above studies of special interest. Books so recent as Ewing's fail to mention mumps.

¹ American Text-book of Obstetrics, 1902, second edition.

² Archives de médecine exper., January, 1902.

³ Presse Médicale, November 8, 1902.

MEASLES. Reckzeh¹ reports the blood findings in ten cases of measles, nine being in children and one in an adult. The red cells showed practically no abnormality. Concerning the leucocytes a review of the literature showed that the majority of observers report a leucocytosis in the beginning with a leucopenia during the eruptive stage; a diminution of the eosinophiles, and, in the beginning, of the lymphocytes; and a relative increase of the large mononuclears. Concerning other forms of cells reports differ. In Reckzeh's cases the total number of white cells was diminished at the height of the disease. The course during convalescence cannot be stated, as in most cases complications existed. Complications such as bronchitis, adenitis, otitis media, etc., caused leucocytosis. Nephritis had no effect. The percentage count showed in the beginning slight increase of the polymorphonuclears, which later in the disease diminished in favor of the lymphocytes. The occurrence of eruption during convalescence caused renewed increase of the polynuclears. Both large and small lymphocytes were diminished at the onset, but later regained the normal number, and, in case of adenitis, were increased. In the return of the leucocytes to the normal the large lymphocytes showed a greater increase than the small ones. Eosinophiles were rarely met with.

SCARLET FEVER. Reckzeh² finds that in scarlatina there is a more marked change in the number of the red cells than in measles, there being a slight anæmia in most cases and a corresponding hæmoglobin diminution. Otherwise no abnormalities were noted. The blood-plaques were found to be very numerous. The behavior of the leucocytes has been investigated by Sacquépée³ and Bowie⁴ as well as by Reckzeh. All agree as to constancy of a leucocytosis (chiefly polymorphonuclear) which increases during the first week and then gradually returns to normal. The lymphocytes increase during the second week, and both forms return to normal in uncomplicated cases by the end of the third week. Complications cause a longer continuance of the leucocytosis. The behavior of the eosinophiles in this disease is peculiar, and is an exception to the rule that the eosinophiles are decreased in febrile conditions. While normal (Sacquépée) or diminished (Bowie) in the beginning they rapidly increase in number and remain high, even after the leucocytosis has disappeared. According to Bowie, the more severe the case the longer the eosinophiles remain subnormal, and in fatal cases they never increase, but soon sink to zero and remain there. Bowie thinks that early eosinophilia is of value in differentiating scarlet fever from tonsillitis, while the succe-

¹ Zeitschrift f. klin. Med., Band xlv. pp. 107 and 201.

² Ibid.

³ Loc. cit.

⁴ Journal of Pathology and Bacteriology, March, 1902.

sive counts of these cells gives information as to the prognosis. If they are normal or subnormal after the first day the disease will probably be severe. As long as relative eosinophilia is present one cannot be sure that complications will not ensue, but if they have returned to normal in the usual way complications are unlikely.

BLOOD CHANGES AFTER THE EXANTHEMATA. Sacquépée,¹ after studying the changes brought about in the blood during the various infections, next investigated the condition of the blood after recovery from these diseases, to see if there was a rapid return to the normal, or whether the disturbance produced by the infection persisted. His results are interesting. While the total number of leucocytes returned to approximately the normal, the percentage proportion remained changed, and this disturbance in equilibrium was demonstrated for six months in patients after successful vaccination and for twelve months after scarlet fever. In both instances there was a relative diminution of the polymorphonuclear cells and the lymphocytes, and an increase of the medium-sized mononuclears. Investigations over a longer period of time have not been carried out. Sacquépée suggests as a possible explanation that the increase of the mononuclear cells may be the outward expression of an acquired immunity. These findings, if confirmed, may explain the varying reports as to the total number of leucocytes and their percentage proportions in different infectious diseases, while they throw some light on the question of immunity. Recently Bezançon and Labbé² have studied the behavior of the leucocytes in different forms of infection, and from their work draw conclusions as to the prognostic and diagnostic value of the total and differential leucocytic count. According to these observers, the leucocyte formula in diseases is the composite image of the local reactions to the microbes at the primary morbid focus, plus the image of the secondary reactions which occur in the blood-forming organs at a distance. Polymorphonuclear leucocytosis is the reaction manifested by the organism whenever an infection by its acute onset necessitates an early and rapid effort to combat it. This reaction is sufficient in superficial infections caused by germs of moderate resisting power, but it proves inadequate to free the organism of germs that are difficult to destroy. Mononuclear leucocytosis, on the other hand, is a reaction that takes place more slowly, but is more durable in its action and is the only one capable of triumphing over a profound and tenacious infection; hence, it follows that infections causing a polymorphonuclear leucocytosis, which represents merely a slight superficial reactionary effort on the part of the organism, are followed by only

¹ Loc. cit.

² *Presse Médicale*, 1902, No. 90; *Journal of the American Medical Association*, December 6, 1902.

transient immunity, while the mononuclear infections, which necessitate a prolonged effort on the part of the organism, generally confer a solid and durable immunity. Hyperleucocytosis with polymorphonuclear increase is chiefly encountered in the saprophytic affections, in localized inflammations, in suppurations, erysipelas, pneumonia, in diphtheria, gonorrhœa, and scarlet fever, and is accompanied by hyperinosis. Hyperleucocytosis with mononucleosis is the appanage of specific diseases, such as mumps, whooping-cough, syphilis, and tuberculosis at certain stages. It is also encountered with abnormal leucocytes, in variola, varicella, etc.

Typhoid conditions, typhoid fever, typhus, and malaria induce leucopenia with relative mononucleosis. The curve of the leucocytosis generally parallels the course of the disease. Return to normal is preceded by certain special modifications in the leucocyte formula, such as mononucleosis, appearance of transitional forms, and reappearance of the eosinophiles, which disappear during the height of the malady. The various infectious diseases do not have any specific leucocyte formula. The blood formula is merely a symptom, but it is constant and varies little during the course of the disease. Any disturbance in this average pathological leucocyte formula denotes a serious, abnormal, complicated course, and is thus valuable for the prognosis. Leucopenia is a grave sign. It indicates an insufficiency in the reacting powers of the blood-forming organs. Excessive hyperleucocytosis and polynucleosis indicate a violent and stubborn infection necessitating violent reactional effort on the part of the organism.

Basophilic Granulation of the Erythrocyte. The question as to the origin and significance of the occurrence of basophilic granules within the red cells continues to be the subject of investigation. Observers have been divided in their opinion as to whether these granules result from karyolysis or karyorrhexis, or whether they represent a specific degeneration of the protoplasm. As exponents of the latter belief the work of Stengel, White, and Pepper,¹ and Simon,² in this country, may be mentioned, as well as that of Bloch³ and Kiel. The first-mentioned authors have searched for the granules in various pathological conditions with a view to learning if possible their origin as well as the diagnostic value of their appearance. In 11 of 18 cases of chlorosis the granules were present, and while polychromatic cells were present in all cases they seemed to bear no relation in intensity or number to the granular cells. In 7 cases of pernicious anæmia the granules were found, and from these and the published reports it is

¹ American Journal of the Medical Sciences, May, 1902.

² International Clinics, 1902, vol. i., twelfth series.

³ Zeitschrift f. klin. Med., Band xliii., Heft 5, 6.

evident that basophilic granulation is a constant condition in advanced stages of pernicious anæmia. In leukæmia (10 cases examined) the granules were present in each instance, though they were usually fine and not numerous. In a series of miscellaneous medical and surgical cases the granules were found in some cases while absent in other cases suffering from the same disease. They, therefore, believe that with the single exception of lead poisoning no condition that they know of regularly causes the granules, though other conditions operate to this end in occasional cases. This constancy in lead poisoning has been attested by Strauss, Grawitz, and recently by Simon,¹ who considers it of great value in diagnosis as well as of prognostic importance in the treatment of lead intoxication. The results of the experiments of White and Pepper have been given in last year's review and need not be repeated. They were convinced of this constancy of the granules in lead workers and in those taking the metal medicinally. Bloch² is one of the very few who differ from this opinion. He believes that the anæmia met with in lead poisoning is due to the metal, but that the changes in the blood are in part due to individual peculiarities of the patients. The granulation of the red cell is also dependent on peculiarities in the subject of the disease, as he has found them in only 50 to 60 per cent. of his cases. (Up to the present time I have never failed to find the granules in cases of lead poisoning examined to ascertain the blood condition.) In some severe acute cases as well as in some chronic cases, according to Bloch, the granules were absent, while in apparently similar cases engaged in exactly the same work they were present. In experimenting on rabbits with lead he has only been able to find the granules in rare instances. The results of Bloch in this particular are in opposition to those of the great majority of observers, and in the face of so much testimony to the contrary can only be attributed to faulty methods.

Loewenthal³ has called attention to the effect of external conditions in the production of granules in guinea-pigs. Thus, when the animals were confined in a cellar the granules were frequent, while when in the open air and protected from bad weather the erythrocytes were normal. The proofs offered that the granules are of protoplasmic origin are summarized by Stengel, White, and Pepper as follows:

1. Karyolytic and karyorrhexic changes may be observed in nucleated red cells without showing any granular change in the protoplasm of the cells; on the other hand, granular degeneration may accompany these nuclear changes without association of the nuclear and granular processes.

¹ Loc. cit.

² Loc. cit.

³ Deutsche med. Wochenschrift, 1902, No. 15.

2. The granulated red cells (coarse or fine granules) never show the remains or a suggestion of a former nucleus.

3. The granules are observed in karyokinetic red cells, and we have seen them associated with the several stages of the dividing nucleus. We cannot believe that such a progressive and retrogressive change can be present in the nucleus at the same time without internal evidence of degeneration.

4. The very early appearance of these granules in the blood taken from the peripheral circulation (twenty-five hours after a dose of seven and one-half grains of the acetate of lead had been taken by one of us) to a certain extent indicates a probable beginning of the destructive changes in the erythrocytes (non-nucleated) of the peripheral blood, rather than in the erythrocytes (nucleated) at the moment in process of formation in the blood-making organs.

5. The granules observed in the bone-marrow were absolutely the same as those seen in the peripheral blood. Those in the nucleated cells (chiefly normoblasts) showed no evidence of derivation from the nucleus, the nuclei being in each case normal in size, shape, and staining qualities, and like those of the neighboring nucleated cells which did not contain granules.

6. Finally, it seems to us that in certain cases of leukaemia in which great numbers of nucleated red cells are always present, if these granules were nuclear derivatives, distinct steps or transitions could be demonstrated. Such is not the case. On the contrary, distinct degenerative changes—karyorrhexis, karyolysis, pyknosis, atrophy of the nucleus, etc.—are present, sometimes with and sometimes without granular protoplasm; but there are never, in our experience, any transitional stages to indicate gradual destruction of nuclei with liberation of substance that has gone to form granules. In addition, very many of the nucleated cells showing nuclear degeneration contained no granules.

On the opposite side of the question that the granules arise from the nucleus of the red cell, and in this way represent a stage in the process by which the red cell loses its nucleus, may be mentioned the case reported by Schmidt.¹ This is very similar to that of Jawein, cited in the discussion of this subject last year, in which that author advocated the theory that the basophilic granulations, like nucleated red cells, are to be looked upon as an evidence of regeneration rather than degeneration. Schmidt's patient was a man, aged forty-two years, who while in Liberia had several attacks of malaria. On leaving in May, 1902, he thought himself completely well, but during the voyage he was seized with fever, and after its fall to normal he took 1 gramme (15 gr.) of

¹ Deutsche med. Wochenschrift, 1902, No. 44.

quinine. In a few hours he experienced pain in the liver and extremities, and the first urine passed five hours after taking the quinine was black in color. This discoloration of the urine persisted for five days. When admitted the patient was very pale, with a loud systolic murmur over the heart, and a rapid and feeble pulse. The blood-count showed the red cells to be 1,600,000, with hæmoglobin 23 per cent. The stained specimen revealed megaloblasts, normoblasts, slight poikilocytosis, myelocytes, polychromatic red cells, increased lymphocytes, and polynuclear leucocytes; occasionally eosinophiles, but no erythrocytes with basophilic granules. Seven days later, during which time the blood picture had not changed particularly, but the patient's feeling had greatly improved, numerous basophilic red cells suddenly appeared. The megaloblasts had suddenly disappeared, and the normoblasts were less numerous. With the appearance of the basophilic red cells the total number of the erythrocytes began to increase. This improvement continued until July 12th, when malarial organisms appeared in the blood. Bearing in mind the black urine following the use of quinine previously, methylene-blue was given: 0.1 gm. ($1\frac{1}{2}$ gr.) five times on the 12th, 0.1 gm. ($1\frac{1}{2}$ gr.) six times on the 13th, 0.2 gm. (3 gr.) five times on the 14th, and 0.2 gm. (3 gr.) five times on the 15th. On the 16th there was a chill and hæmoglobinuria appeared, lasting two days. This is the only case that Schmidt can find in which black-water fever occurred after methylene-blue administration. During the period of hæmoglobinuria basophilic granules were absent from the blood and did not reappear until July 27th, when the blood-cells began to increase in number. The fact that the basophilic granules are seen only during convalescence speaks against their being a form of degeneration, and in practically all cases of malaria the granules are found at that time. Schmidt is convinced that both basophilic granulation and the so-called "polychromatophile degeneration" of the red blood-cells are the product of a more or less complete karyolysis.

The appearance of granules in a red cell whose nucleus is apparently intact may be explained in three ways: (1) The granules may originate during the process of division, at which time the nuclear membrane is broken, and after this returns to its original condition; or (2) two nuclei may originate by the division, one remaining intact, the other forming the granules; or (3) there is no reason why a nucleus from whose periphery small particles are loosened may not continually "regrow" to its normal circumference.

Apparently in direct opposition to Schmidt's case is the one reported by Guyot¹ of paroxysmal hæmoglobinuria, brought about by exposure

¹ *Gaz. deg. Caped. e. dell. Clin.*, March 16, 1902.

to cold. Within twenty days the patient, a man aged twenty-four years, had ten attacks of hæmoglobinuria, in each of which the blood showed basophilic granules in the red cells after staining with Loeffler's solution or Ziemann's solution of methylene-blue and borax. The granules were uniformly distributed throughout the cell body, or were arranged eccentrically. The number was in direct proportion to the intensity of the attack as regards the height of the temperature. Before the attacks the granules were always found in small numbers, and they increased in proportion as the attack drew nearer.

Finally, to make the question of basophilic granules still more complicated a new idea is advanced, namely, that they are normally present in the red cells, but may be increased pathologically. This theory was first advocated, according to Loewenthal,¹ by Schur and Löwe,² and has recently been sustained by Rosin and Bibergeil,³ whose investigations on vital staining have already been mentioned, and by Reitter.⁴ Rosin and Bibergeil found that in normal blood preparations, after six hours' exposure to the stain (methylene-blue), in certain red cells bluish granules or threadlets (*Fädchen*) were seen. These were arranged crucifix-like, centrally or diffusely. At times the granules were fine, again they were coarse. The granules were somewhat thicker and more closely set when stained with toluidin-blue and theonin and methylene-azure, but they can be stained by any basic dye, even with neutral red. In a case of lead poisoning examined by these authors the granules were found in a large number of red cells, and somewhat larger in size than in normal blood. The granules are very resistant, while the cells containing them dissolve much more quickly than the other cells. After two days the granules are found free in some places and arranged as when the cells were present. They believe that these granules are the "basophilic granules," and that they occur normally in the red cells, but may be increased under pathological conditions. Reitter, having found basophilic erythrocytes in twenty cases of advanced phthisis with anæmia, and also in normal individuals, believes they may occur both physiologically and pathologically.

Anæmia. **CEDEMA IN ANÆMIA.** An interesting series of investigations by Houston⁵ deals with the relation existing between the blood condition and the body weight in cases of anæmia associated with œdema. His observations were made on 4 cases of Bright's disease, 10 of chlorosis, 1 of splenic anæmia, 6 of pernicious anæmia, and 1 of anæmia from hemorrhage. His conclusions are :

¹ Loc. cit.

² *Zeitschrift f. klin. Med.*, 1900, Band xl.

³ *Deutsche med. Wochenschrift*, January 16-23, 1902.

⁴ *Weiner klin. Wochenschrift*, November 20, 1902.

⁵ *British Medical Journal*, June 14, 1902.

1. The absence of the loss of weight in anæmic conditions and the fact that the patient seldom seems emaciated is mainly due to the fact that there is abnormal accumulation of fluid in the blood and tissues. If this excess of fluid were deducted it would probably be found that in these as in other chronic illnesses there is a progressive loss of weight in proportion to the severity and duration of the disease.

2. In the cure of such anæmic conditions, especially chlorosis, the first stage seems to be the elimination from the blood and tissues of this excess of fluid.

3. A gain of weight in a case of pernicious anæmia under treatment and without an improvement in the hæmoglobin is to be regarded as an unfavorable sign, indicating dilution of the blood and consequent escape of serum into the tissues. It may, however, be a critical phase of the disease, and may indicate the first step toward concentration of the blood. Immediately after the sudden increase in œdema there is either a marked improvement or the patient dies.

4. The œdema of anæmic conditions seems to result from a hydræmic plethora of the blood, and is somewhat different in origin and nature from the œdema usually found in Bright's disease.

5. Careful observations in the manner indicated of anæmic conditions, namely, a record of the weight and hæmoglobin value of the blood, may furnish very interesting results. The points to which attention should be directed are the occurrence of hemorrhages (epistaxis, etc.), œdema, diarrhœa, and profuse sweating. My observations convince me that these symptoms are often the result of dilution of the blood and may be nature's method of counteracting the abnormal and excessive volume of the blood.

CLASSIFICATION OF ANÆMIA. With our increasing knowledge of the blood and its formation a classification of the anæmias based on the underlying pathological changes becomes more and more necessary. According to Pappenheim¹ all anæmias are secondary, even the anæmia of Biermer, and in all instances there is a more or less marked relative insufficiency in the hæmoglobin-forming function of the bone-marrow as compared with the necessary demand for blood. This is precisely the view I have entertained and repeatedly expressed. A division into severe and mild anæmias is unsatisfactory because too gross and external. Thus from the clinical blood finding it is impossible to state with certainty the nature of an anæmia, and this can only be obtained with certainty by microscopic examination of the bone-marrow which, for the time being, cannot be accomplished ante-mortem. The appearance of megaloblasts in the blood is evidence of a distinct form of

¹ *Zeitschrift f. klin. Med.*, Band xliii.

anæmia, but should these not appear this form cannot be excluded. While the appearance of megaloblasts in the blood indicates an increased formation in the marrow, yet they may be increased in the marrow without being found in the circulation. Pappenheim therefore suggests that the secondary anæmias be classified not on the clinical blood examination, but on the other clinical symptoms in conjunction with the anatomical bone-marrow changes, as follows :

1. Primarily hæmophthical. In these the consumption of blood is increased.

(a) Those in which the mode of blood formation is normal, but is augmented. These include the *traumatic anæmias*. In them megaloblasts are present in the marrow but differentiate to normoblasts, and therefore are not seen in the blood.

(b) Those with abnormal blood regeneration. The *toxogenic anæmias*. In the marrow there is a marked increase of megaloblasts that usually appear in the blood-stream, but not always.

(1) Biermer's cryptogenic anæmia (progressive pernicious anæmia).

(2) Pyridin and arsenic intoxication (Bettmann).

(3) Gastric cancer, syphilis, etc.

(4) Bothriocephalæmia, anchylostomæmia, Gusserow's anæmia of pregnancy.

2. Primarily myelophthical. The blood-forming organs are reduced.

(a) Simple traumatic extirpation of the marrow (Haasler), which practically does not occur.

(b) Elimination of the marrow through plastic substitution by lymphatic growth. This in the beginning is partial, circumscribed, or multiple, as in anæmia lymphatica (with swelling of the glands) or myelogenous pseudoleukæmia (without swelling of the glands). Later this substitution may be diffuse, in which case lymphæmia occurs.

(c) Elimination by heterogeneous, multiple, circumscribed neoplasms (carcinomatous metastases). These myelomata exert a toxic action on the surrounding uninvolved marrow substance.

(d) Diffuse, direct, specific intoxication of the marrow itself, either natural or experimental, has not as yet been described.

This division, though based on pathological conditions, can scarcely become general, as no means of ante-mortem diagnosis are given. It is, however, a step in the right direction, for every clinician has experienced difficulty in attempting to differentiate anæmias from the blood picture alone. As will be noted, *chlorosis* is not included in this classification. It may, however, according to my own opinion, be incorporated in the second group, the myelophthical anæmias. As far as present knowledge goes it would appear most probable that this

disease is occasioned by some form of hereditary or acquired insufficiency, as the hæmogenic function of the bone-marrow. There does not seem to be an excessive destruction of blood.

Chlorosis. In spite of the great frequency with which this condition is found, comparatively little study has been devoted to it of late. Many variations in opinion as to the fundamental cause and its mode of action exist, and much investigation is required before these questions can be definitely settled. The work of Strauss¹ may be mentioned as bearing on the supposed effect of copræmia in the production of the disease. This author, experimenting on rabbits, brought about complete stoppage of the bowels by closing the anus. He was unable to find any change in red cells or hæmoglobin, and only a moderate leucocytosis appeared. Experiments carried out on the serum showed no diminution in action, nor was any loss noted in the serum of patients suffering from persistent constipation.

The mode of action of the causal agent must be either in the line of inhibiting in some way the blood production or in injuring the cells normally formed. Sahli² remarks that the absence of urobilin in the urine of the chlorotic is evidence that no abnormal destruction of red cells occurs, and believes that the blood formation is not sufficient for the demands of the growing organism. The occurrence of the disease at puberty also speaks for this assumption. This is the view that I have repeatedly expressed in *PROGRESSIVE MEDICINE* and elsewhere.

Cavazza,³ on the contrary, has found that in chlorosis the resistance of the red cells is diminished, and that in severe forms of chlorosis, at the height of the disease, the urobilin is always increased. (This statement is contrary to my experience.) As this increase often lasts only for four or five days, after which it may be below the physiological normal, it may not be demonstrable. Psychical disturbances, fever, and both hot and cold baths, may lead to urobilinuria in chlorotic patients. According to Cavazza, the urobilinuria of chlorotics has certain specific characteristics. Thus in chlorosis brought about by cold (a form frequently mentioned in Italy—"Chlorosi da freddo") the use of a cold bath brings about urobilin increase, while in those forms of chlorosis that grow worse in the warmer parts of the year the hot bath brings on urobilinuria. In general, an increase of urobilin was found to occur more readily in chlorotics than in healthy individuals. The distinction of such forms of chlorosis has not been made by clinicians in other parts of the world.

¹ Loc. cit.

² *Lehrbuch der klinischen Untersuchungsmethoden*, 1902.

³ *Il Policlinico*, October, 1901.

On this question the work of Erben¹ is of interest. The author records the result of his chemical analyses of the blood in two cases of chlorosis as follows: 1. The amount of albumin was diminished in consequence of the diminution of hæmoglobin; the relation of albumin to globulin was normal; the fibrin content was increased. 2. The fat content was increased considerably in the serum and in the erythrocytes; the lecithin in the entire blood as well as in the serum was diminished, while in the erythrocytes it appeared to be increased. The cholesterin in the blood as well as in the serum and erythrocytes was diminished. 3. In the ash, the phosphoric acid, potassium, and iron were markedly diminished on account of the reduced content in erythrocytes; calcium and magnesium were increased. The increase in sodium chloride was only an apparent one, since the chlorotic blood has a higher percentage of serum (760 to 780 gm. serum in 1000 gm. of blood) than normal blood; the sodium chloride content of the serum is not increased.

Taking up the question as to whether in chlorosis there is red cell destruction or insufficient new formation of the erythrocytes, the following speak against an increased blood destruction:

1. That lecithin and phosphoric acid, which are the important constituents of the erythrocytes, are found to be diminished in the serum. A diminution of the lecithin, when a considerable quantity is made free by destruction of the blood-corpuscles, would be surprising, as chlorotic blood appears to be able to burn fatty substances with much more difficulty, as one can assume from the constantly high fat content.

2. That the serum is free from a quantitatively determinable portion of iron. In pernicious anæmia, in which increased destruction of erythrocytes is practically certain, Erben has been able to demonstrate iron quantitatively in the serum.

3. That the substance of the erythrocytes is very poor in extractives.

On the other hand, the following findings might be looked upon as showing increased blood destruction:

1. The high potassium content of the serum. That other circumstances here play at least a part is to be assumed, for potassium is easily diffusible and easily excreted, and would not be likely when a considerable quantity is made free in the organism to show itself especially in the serum.

2. The high fat content of the erythrocyte substance can be looked upon as proof in this direction. Owing to lack of comparative analyses there is no other way to interpret this finding, but Erben mentions that as the leucocytes and perhaps fat droplets from the serum are thrown

¹ Zeitschrift f. klin. Med., Band xlvii., Heft 3, 4.

out by centrifugating along with the erythrocytes this may easily account for the apparent increase.

Another explanation of chlorosis is attributed to Dufougeré.¹ This author, in an essay on chlorosis and its relation to marriage and its treatment with orchitic extract, revives the ancient theory that the disease is due to an auto-intoxication of menstrual origin and to accumulation in the blood of toxic principles which are not destroyed by the internal secretion of the ovary. By re-establishing this internal secretion, which is lessened or absent, chlorosis and its symptoms are caused to disappear. Marriage influences this secretion, and restores it if it has ceased. This re-establishment of the secretion is due to the absorption during coitus of a certain specific principle which acts directly on the ovary. The ingestion of "orchitic liquid" by chlorotics will establish this internal secretion.

RELATION BETWEEN CHLOROSIS AND GRAVES' DISEASE. Wybauw² describes two cases of Graves' disease in which the blood examination showed the existence of a severe anæmia. Under treatment with chalybeate baths there was marked improvement, and when the blood became normal the symptoms of Graves' disease no longer troubled the patients. The author points to numerous cases of chlorosis in which tachycardia and a slight goitre are present, and believes that anæmia in Graves' disease acts injuriously on the cause of this disease, for the curing of the anæmia has a great influence on the entire clinical picture. Unfortunately, the author does not recognize the occurrence of slight enlargement of the thyroid gland and tachycardia as practically constant or at least very frequent symptoms of chlorosis. This, however, is not Graves' disease, and the distinction must be recognized.

DIAGNOSIS AND TREATMENT. There is nothing new to offer. The diagnosis cannot be made from the blood examination alone; but with the physical examination and the fact that the patient is usually a young female the diagnosis is comparatively easy in most instances.

The frequency with which cardiac murmurs are heard in chlorosis and the coincident occurrence of increased cardiac dulness is well known. This latter has generally been attributed to a cardiac dilatation, but von Ebner³ offers another explanation based on an examination of six chlorotic patients whose hæmoglobin ranged between 27 and 37 per cent. By means of the fluoroscopic examination he found that borders of the lung were retracted, thus simulating cardiac dilatation. Besides this there was present a high position of the diaphragm, in conse-

¹ *Gaz. méd. de Nantes*, August 16, 1902.

² *Journal méd. de Bruxelles*, 1901.

³ *Festschrift des Nürnberger Aerztevereins*, 1902.

quence of which the heart rotated on its transverse axis. The cause of these changes is to be found, according to von Ebner, in a diminution of respiratory activity.

The treatment presents few additions. Iron in some form is always indicated, and in spite of the innumerable preparations placed on the market within the last few years the old-fashioned Blaud's pill retains its popularity. The treatment with orchitic substances is too little tried to admit of a decision as to its merits.

Pernicious Anæmia. Some important articles on this subject during the past year have directed attention into new channels. Warthin,¹ in his consideration of the pathology of pernicious anæmia, takes up particularly the changes occurring in the hæmolymp nodes. This author has carefully reviewed the literature on the changes hitherto reported in the lymph-glands, and finds that they have been practically disregarded. Our knowledge as to lymph-gland changes is based on a summary by Eichhorst (1878), who stated that swelling of the mesenteric glands was of rather frequent occurrence; a case reported by Weigert (1880) in which the cervical, thoracic, portal, omental, as well as the mesenteric glands were red and swollen; of Osler (1885 to 1894), that in three of his cases the glands were of a deep-red color, resembling splenic tissue; and isolated records since the time of Eichhorst. This paucity of observation is to be explained on the assumption that lymph-gland changes are rare in pernicious anæmia; that the changes are of such a nature as to easily escape observation; or that in many cases no adequate examination of the lymph-glands has been made. These two latter assumptions are probably the correct ones, as in every one of Warthin's eight cases the prevertebral lymph-glands, particularly the hæmolymp nodes (cervical, thoracic, or retroperitoneal) showed changes, either gross or microscopic, which might be regarded as belonging to the essential pathology of the disease. These changes in both lymph and hæmolymp nodes varied greatly in degree. In only one case were changes found in the peripheral glands that could be regarded as belonging essentially to pernicious anæmia. Likewise the changes in the mesenteric glands were not constant, occurring in but two cases. In all the eight cases, however, the changes were constantly found in the prevertebral, retroperitoneal, and cervical lymph and hæmolymp glands, indicating a degree of hæmolysis greater than that found either under normal conditions or in such diseases as chronic tuberculosis, typhoid fever, sepsis, etc., in which evidences of increased destruction of red cells are also found in these glands. From his observations he concludes:

¹ American Journal of the Medical Sciences, October, 1902.

1. Pernicious anæmia is essentially a hæmolytic disease, the hæmolysis being due to some as yet unknown poison comparable in its effects upon the blood and blood organs to the action of toluylenediamine. Whether the poison is the result of auto-intoxication or infection remains to be determined.

2. The poison of pernicious anæmia stimulates the phagocytes of the spleen, lymph and hæmolymph glands, and bone-marrow to increased hæmolysis (cellular hæmolysis). Either the phagocytes are directly stimulated to increased destruction of red cells or the latter are so changed by the poison that they themselves stimulate the phagocytes. The hæmolysis of pernicious anæmia differs only in degree, not in kind, from normal hæmolysis or the pathological increase occurring in sepsis, typhoid fever, etc.

3. It is not improbable that from the destruction of hæmoglobin poisonous products (histon?) may be formed which have also a hæmolytic action—a vicious circle of hæmolysis may thus be produced. No proof of this exists at present.

4. The hæmolysis of pernicious anæmia is not confined to the portal area, as according to Hunter, but in some cases at least takes place also to a large extent in the prevertebral lymph and hæmolymph nodes and bone-marrow. In the majority of cases the spleen is the chief seat of the blood destruction. No evidences of hæmolysis in the liver, stomach, and intestinal capillaries were found in the eight cases. The hæmosiderin of the liver and kidneys is carried to these organs as some soluble derivative of hæmoglobin, is removed from the circulation as hæmosiderin by the endothelium, and then transferred to the liver or kidney cells. The deposit of iron in these organs is of the nature of an excretion.

5. In the majority of cases only slight reaction for iron is found at the sites of actual hæmolysis (spleen, lymph and hæmolymph glands, and bone-marrow). The greater part of the pigment in the phagocytes of the spleen, lymph, and hæmolymph glands does not give an iron reaction while in a diffuse form. When changed to a granular pigment the iron reaction may usually be obtained. The change to hæmosiderin is for the greater part accomplished by the endothelium of the liver and kidneys.

6. The varying pathological conditions found in these different cases of pernicious anæmia can be explained only by a theory of cyclical or intermittent hæmolysis. This theory is also borne out by the exacerbations so frequently seen clinically. The autopsy findings, in so far as evidences of hæmolysis are concerned, will depend upon the relation between the time of death and the stage of hæmolysis.

7. The changes in the hæmolymph glands found constantly in these

eight cases were: dilatation of the blood-sinuses and evidences of increased hæmolytic, as shown by the increased number of phagocytes containing disintegrating red cells and blood-pigment. In some of the cases these changes were accompanied by a great increase in size and apparent increase in the number of the hæmolymp glands; in other cases there was no hyperplasia, the only evidences of the changes present being that obtained by the microscopic examination. The changes found cannot be regarded as specific of pernicious anæmia, since it is probable that they may be produced by other infections or toxic processes characterized by great hæmolytic.

8. The lymphoid and megaloblastic changes in the bone-marrow do not form an essential part of the pathology of pernicious anæmia, and are to be regarded as of a compensatory nature—an increased activity of red-cell formation to supply the deficiency caused by the excessive hæmolytic.

Interesting as these observations of Warthin undoubtedly are, the conclusions from them must be drawn with care. He has undoubtedly added a strong chapter of evidence to the now accepted view that pernicious anæmia is essentially a hæmolytic disease, and has possibly found the location of the active hæmolytic processes. The source of the hæmolytic agents and their place of primary activity still remain obscure, though Hunter's views remain as suggestive as before. The secondary rôle ascribed by Warthin to the bone-marrow is, however, not entirely satisfactory. It remains to be shown that the formation of corpuscles and their hæmoglobinous impregnation are not distinct processes, and that the hæmolymp glands are not merely compensating in the latter process for the insufficient splenic function. Speculations of this sort, however, can lead to no very useful results. The work of Warthin is a splendid contribution; the interpretations must be reserved till more investigations have been made.

The observations of Warthin tend to emphasize the importance of the lymphatic tissue in the pathology of the disease, and are in accord with the findings of Strauss.¹ This author, in investigating the relation between pernicious anæmia and the gastro-intestinal canal, examined sections of the stomach from ten cases of pernicious anæmia. The number of lymphocytes in the gastric wall was found to be increased markedly in five instances, moderately increased in two, and not especially changed in three. This increase was met with more markedly in the deeper layers of the mucosa, contrary to the distribution of these cells in the neighborhood of erosions or ulcers. At the same time evidence of sclerosis in the form of connective tissue growth was found

¹ Berliner klin. Wochenschrift, 1902, Nos. 34, 35.

only rarely, and then to no marked degree. No definite relation of the increase of lymphocytes to the condition of the gland parenchyma could be established. The gland tissue was more or less diminished in 60 per cent. of the cases. The increase of lymphocytes in the stomach wall Strauss was unable to find in other conditions, and he thinks it somewhat distinctive of pernicious anæmia, and without insisting on a relationship to the increase of lymphocytes in the blood, believes there is a certain parallel between them. He is inclined to attribute the increase to a formative excitation of the pre-existing lymphoid tissue in the gastric wall, which may be analogous to the increase of the mononuclear cells which has been noted in the bone-marrow in pernicious anæmia. The relative increase of lymphocytes in the blood in pernicious anæmia to which Strauss and Rohnstein¹ direct particular attention in their monograph of 1901 has been verified by many observers, and there seems to be a certain connection between all these observations if it be admitted, as it generally is, that the lymphocytes are manufactured by the lymphoid tissues. Another interpretation is suggested by Hamel.² In a case reported he comments upon the great difficulty in distinguishing the large, pale, polychromatic megaloblasts from the large lymphocytes with their variously staining protoplasm and nuclei. Certain border-line forms of cell were met with in which a classification was impossible; and from these border-line cells, cells in all stages of transition, to the megaloblasts on one hand, and to the lymphocyte on the other, were found. He does not say that in this case a change from megaloblasts to lymphocytes or *vice versa* was present, but in view of the theories advanced by Pappenheim and others as to the common origin of blood-cells from the same parent cell this finding is worthy of note. From this point of view the increased number of lymphocytes in the blood could be explained on the ground that there was a return to the embryonal condition when such excess of mononuclear cells is the rule. This approximation in character of megaloblasts and large lymphocytes has been demonstrated by Pappenheim in embryonal marrow.

White³ attributes the leucopenia so frequently found in pernicious anæmia to a diminution in the polymorphonuclear cells with a resultant relative lymphocytosis—a view that would suggest depression of the bone-marrow.

NATURE OF THE DISEASE. The toxic origin of pernicious anæmia is pretty generally accepted, though the possibility of an infection is

¹ See last year's PROGRESSIVE MEDICINE.

² Deutsche med. Wochenschrift, 1902, Nos. 16, 17.

³ University of Pennsylvania Medical Bulletin, April, 1902.

admitted by Warthin and insisted upon by Hunter. The latter author,¹ in reiterating his widely known views, suggested that the disease be called "infective hæmolytic anæmia." He believes that this form of anæmia—the "idiopathic" anæmia of Addison—differs essentially from the "progressive pernicious anæmia" of Biermer, in that the latter is a form of anæmia which is brought about by many causes, while the former has a specific infective etiology. Hunter takes occasion to correct the general impression that he (Hunter) believes that pernicious anæmia is due to oral sepsis, septic gastritis, etc. These conditions can bring about a septic anæmia and predispose—by offering sites of entrance to the specific cause—to pernicious anæmia, but something more must be added, and the addition is characterized by an intense hæmolysis and a peculiar glossitis. This "something" he believes he has definitely proved to be due to exposure to drain poison in five of his twenty-five reported cases. He does not clearly state whether the specific infection can gain entrance to the mucosa of the intestinal tract when no oral sepsis is present, and the presumption is that this condition must precede in all cases of true Addison's idiopathic anæmia. In this view Hunter stands practically alone. While the influence of gastro-intestinal conditions on the production of pernicious anæmia is well recognized, the opinions as to the significance of the gastro-intestinal atrophy so frequently found, differ. Strauss² states that the assumption that such atrophy can cause pernicious anæmia is only a hypothesis which requires further proof. As to the existence of an enterogenous factor bothrioccephalus anæmia is proof, and among other causes an enteric one should always be thought of. Strauss believes with Grawitz that an individual disposition plays the chief part, and given this tendency any one of a number of conditions can act as a determining cause. (This view I expressed in the *Twentieth Century Practice of Medicine*, vol. vii.) Without denying the possibility of auto-intoxication Strauss points out that only a certain number of people with atrophy of the gastro-intestinal glands under the influence of poor nutrition show pernicious anæmia.

That the anæmia is secondary is also quite generally accepted by most authors except Hunter, and my own opinion,³ as quoted by Hunter,⁴ remains unchanged.

"We are of the opinion that it makes no essential difference what the cause is, since the ensemble of symptoms remains the same. Hence we repeat that we regard pernicious anæmia more as a symptom-

¹ Clinical Journal, October 29, 1902, and Lancet, January 31 and February 7, 1903.

² Loc. cit.

³ Pepper and Stengel, Verhandlung d. Congresses f. innere Med., 1896, Band xiv. p. 63.

⁴ Loc. cit.

complex than as an independent disease—a form of ‘cachæmia’ which may arise from digestive disturbances in the stomach and intestines, from intestinal parasites, in pregnant or puerperal women, or through unknown causes.”

The multiplicity of causes would indicate that an intoxication was present rather than an infection. Concerning the action of this toxin there is also a difference of opinion as to whether it causes increased blood destruction or diminished blood formation or both. As we have seen, Warthin and Hunter believe that hæmolysis is the chief factor, the marrow changes being secondary. This view is also supported by Syllaba,¹ who has studied the serum in five cases of pernicious anæmia. This author believes that the hæmolysis forms the essential feature of the disease, and that the blood destruction is brought about by a hypothetical poison-bacteria, toxin, or enzyme. This reaches the blood paths either through the digestive tract (hæmolysis pernicioxa exogenes originis gastro-intestinalis), or from diseased tissue (hæmolysis pernicioxa endogenes), or, exceptionally, also through the lungs and skin.

Sahli² speaks of a specific action on the bone-marrow, though he mentions cases in which the marrow is not red—aplastic form of pernicious anæmia. The probabilities are that there is both an increased blood destruction and a diminished blood formation, which need not necessarily bear the same relationship to each other in all cases.

NERVOUS CONDITIONS. The frequency with which nervous disturbances occur in pernicious anæmia has been mentioned in previous considerations of this topic. Billings³ has made this the subject of his Shattuck lecture, and his observations may be abstracted.

According to Bastinelli, the cases may be divided into two groups: One group, in which the pernicious anæmia is the predominant factor, and the cord lesion developing later with only slight clinical manifestations, or, possibly, with only subjective disturbances. The second, in which the nervous phenomena develop first or coincidently with the anæmia, the nervous phenomena predominating and overshadowing the symptoms due to the anæmia, and the case rapidly developing into one of paraplegia, with flaccid muscles, loss of sphincter control, bed-sores, and death within a few weeks. This makes a fairly good clinical division, although all cases cannot be classified under it. The clinical symptomatology of Billings’ 36 cases is as follows: In all cases paræsthesia occurred early in the history of the disease. It appeared simultaneously in the feet and hands of all except 1, where it

¹ Rozprawy Ceské Akademie, ix. Jahrg., 2 Abth., No. 22.

² Lehrbuch der klin. Untersuchung. Methoden, 1902.

³ Boston Medical and Surgical Journal, August 28 and September 24, 1902.

was confined to the toes of one foot and to the ulnar border of one hand. In 4 females and 2 males the anæmia preceded the nervous phenomena by a period of over eighteen months. In 24 of the cases only subjective disturbances were present, such as tingling, numbness, coldness, heat, formication, etc., of the hands or feet, or both. Hyperæsthesia occurred in 1; disturbed temperature sense occurred in 2. In 10 patients the subjective nervous disturbances were associated with spastic and usually with an ataxic condition, which grew steadily worse, and in 3 developed into complete flaccid paraplegia, with loss of knee-jerk, loss of voluntary bowel and bladder control, and the development of œdema and bed-sores; 1 died while in a state of spastic paraplegia and 4 are living with spastic ataxic paraplegia and very troublesome subjective sensory disturbances; 1 died with simple sensory disturbances only without ataxia, spasticity, or paraplegia, whose spinal cord showed dorsolateral sclerosis; 1 died with all the evidences of insanity, but no post-mortem could be obtained. Contrary to the statement of Burr that a girdle sensation is never present with the cord lesions of pernicious anæmia, Billings found it in all the cases of his series in which spasticity developed. As has been observed by Putnam, some of these cases complained of a peculiar paræsthesia of the mouth. One complained of a sensation as though threads of cotton were in the mouth; another of dryness, though saliva was present; and a third, of burning sensation not allayed by cold water. The sexual power of the males was found to be diminished, and menstruation, as a rule, ceased in all the younger women. The severe cord lesions occurred in the female patients at a comparatively early age; thus, one was thirty-four; one, thirty-nine; one, forty; and one, forty-seven. Of the males showing cord symptoms, one was twenty-six; one, thirty-six; one, forty; two, fifty-six; one, sixty-two. The sclerosis of pernicious anæmia as described by various authors and as illustrated by the cases of Billings consists of a sclerosis either of the posterior columns alone or with a like change in the lateral tracts. As a rule, the lesions are most marked in the upper thoracic and lower cervical regions, diminishing both above and below. In the lateral tract the whole crossed pyramidal tract may not be involved, and there may be invasions, wholly or in part, of other portions of the lateral tract. The sclerosis is not always diffuse, but may be focal, but not necessarily symmetrically distributed. The anterior pyramids may be involved at different heights. The process is thus characterized by the fact that it apparently does not involve a whole system either centrifugally or centripetally at all levels of the cord. The gray matter is usually not affected; at the most, some overpigmentation of the Nissl bodies and a diminution in the cells of the column of Clarke have been found. Another character-

istic is that the whole neuron is not involved in this sclerosis. In most reports the posterior ganglia have been found unaltered, and the posterior root zone is practically always free. The cells in the anterior horns are not changed, and there is usually no degeneration of the peripheral nerves. It cannot be called a systemic degeneration, because an entire system is not involved, nor is a whole neuron implicated in the degenerative process. Most observers describe the degenerative process as being of two kinds—one which seems to be more acute, consisting apparently of a process in which the nerve sheath becomes swollen, stretched, and filled with debris chiefly made up of fat droplets. This is usually unattended by an increase in neuroglia, and in consequence the degenerated nerve sheath and fibre and its products are absorbed, leaving a vacuolated appearance in which sometimes a normal or relatively normal axon may be seen. Coincidentally another more chronic process occurs in which there is an associated glia increase with sclerosis, although contraction apparently does not occur as in some other sclerotic conditions. Among the various factors which have been considered as causal in the production of the cord changes of pernicious anæmia may be mentioned multiple hemorrhages, arterial thickening, acute myelitis, primary change in the gray matter of the cord, brain, and ganglia, anæmia, and, finally, the influence of some toxic agent, which latter theory, according to Billings, is probably correct.

His conclusions are:

1. That there is a well-established relation of diffuse cord degeneration with pernicious anæmia.
2. It seems highly probable that the hæmolysis and the cord changes are due to the same toxin.
3. While the source of the toxin is unknown the fact that gastrointestinal disturbance is so common in the disease would lead one to suppose that it is of intestinal origin.
4. The diffuse degenerations of the spinal cord which occur in conditions without pernicious anæmia do not appear to differ essentially from those of pernicious anæmia.
5. It is possible that a common blood-circulating poison exists which may expend its force upon the blood in one individual, upon the nervous apparatus in another, and coincidentally upon the blood and spinal cord in others.

DIAGNOSIS. In a disease in which so many etiological factors are active, and which can be simulated by so many conditions, diagnosis is often difficult, and cases illustrating this are frequently published. Billings¹ is of the opinion that the diagnosis can be made from the blood examination alone, and states that "blood of the pernicious

¹ Loc. cit.

anæmic type is characteristic and easily recognized. When we find a marked oligocythemia with the presence of many poikilocytes, microcytes, and macrocytes, with polychromatophilia, and a relatively high percentage of hæmoglobin, with a normal or higher than normal color index, it affords a type of blood which is found in no other anæmic state. If to this we add the presence of nucleated red cells, and especially of megaloblasts, the foetal type of red cell, and of a few myelocytes which together indicate degeneration of the bone-marrow, the diagnosis is reasonably certain without post-mortem examination."

While a positive result such as above given may be considered as being diagnostic in many instances, certain of the special features may be absent, as megaloblasts or even any form of nucleated cells, yet the autopsy shows changes characteristic of pernicious anæmia. Kõrmöcz¹ records the blood examinations in 5 cases of pernicious anæmia confirmed post-mortem, with special reference as to whether the blood was of a macrocytic or megaloblastic type or not. In 2 of the 5 cases no megalocytes were found, and in 1 case no nucleated cells of any kind; and in 1 case with onset of a pleurisy the megaloblasts hitherto found in abundance disappeared. The absence of megaloblasts does not, therefore, exclude pernicious anæmia. As to their presence, Kõrmöcz has found them in no other condition, but other authors have reported such an occurrence. He, therefore, concludes:

1. That in many cases the blood picture of pernicious anæmia cannot be distinguished from that of secondary anæmia, yet in these cases the bone-marrow shows a megaloblastic type.

2. That the histological picture of pernicious anæmia is often of a megaloblastic, more often of a macrocytic character. These symptoms have only diagnostic importance when supported by other blood findings and the results of clinical investigations.

Pappenheim² also emphasizes this fact. I agree with White³ that no disease can be diagnosed absolutely by means of the formed elements of the blood. In the blood picture of pernicious anæmia White mentions as important marked and early erythrocytic degeneration, poikilocytosis, anisocytosis, polychromatophilia, and basic granulation, nucleated red cells with a predominance of megaloblasts. If karyokinesis is found in these larger cells with the above blood picture, the occurrence is almost pathognomonic. The leucocytes are normal in number or decreased with a relative lymphocytosis.

TREATMENT. The treatment of this condition offers nothing new. That various gastro-intestinal conditions can be benefited by proper diet,

¹ Deutsche med. Wochenschrift, 1902, No. 1.

² Loc. cit.

³ University of Pennsylvania Medical Bulletin, April, 1902.

and, where indicated, by flushing the stomach and bowels, is evident. If the anæmic condition is due to causes removable in this way cure is possible, and in any event proper feeding will increase the body resistance to any disease. As Strauss¹ says, so long as our knowledge of the disease is so limited, and knowing the rôle played by the intestines in many cases, attention should be directed to the gastro-intestinal tract in every instance. That, however, gastric or colonic lavage is a specific for pernicious anæmia is doubtful. Ewald² reports a marked improvement in a case of pernicious anæmia following the transfusion of 200 c.c. (6 3/4) of defibrinated blood. This improvement was probably due to some material in the transfused blood which acted as a stimulant to the hæmopoietic organs.

Leukæmia. No other disease in which the blood is chiefly concerned has been the subject of so much investigation as leukæmia and the conditions which resemble it. Inasmuch as the diagnosis depends to a large extent on the number and character of the colorless corpuscles, it is natural that attention should be directed to the source of these cells as the guide to the organs at fault, for with the exception of Löwit and a few others it is generally believed that leukæmia is a disease of the blood-forming organs. Of the various theories concerning the genesis of the leucocyte may be mentioned that of Uskoff, whose division is according to the number of nuclei the cell contains—the mononuclear being the young form, the polynuclear the older form. Thus the lymphocyte is the unripe, the mononuclear and transitionals the fully ripe, the multinuclear the overripe, and the eosinophiles a still more ripened form of the leucocytes, all being derived from the lymphocyte. Ehrlich, in his study of the bone-marrow, classifies the white cells there found according to the granulations present into neutrophile, eosinophile, basophile, and non-granular cells as the principal divisions. Concerning the non-granular cells and the relation in which they stand to the granular cells of bone-marrow on the one hand and the lymphocytes of the lymphatic tissue on the other, there has been much discussion. If it is assumed that no lymphocytes originate in the bone-marrow (Ehrlich's view) the atypical cases of lymphatic leukæmia without swelling of the lymph-glands or spleen are difficult to explain. Recent investigators have tried to show that while normally in the human adult the lymphocytes are produced by the lymphatic tissue and the other leucocytes by the bone-marrow, under pathological conditions a return to the embryonal state occurs with consequent change in the site and mode of blood formation. Among the various communications along this line may be mentioned those of Pappenheim,³ Wolff,⁴ and

¹ Loc. cit.

² Deutsche med. Wochenschrift, Verein Beilage, 1902, No. 31.

³ Zeitschrift f. klin. Med., Band xlvii., Heft 3, 4. ⁴ Ibid., Band xlv., Heft 5, 6.

Michaelis and Wolff.¹ The literature is so voluminous that a full consideration is impossible, nor can all the various minute differences in the individual theories be brought out. The tendency of these newer observers is to attribute to the bone-marrow the power of producing every form of leucocyte. The conclusions of Wolff may be given as representing the farthest development along this line :

1. The principal points of difference hitherto thought to exist between the lymphocytes and granulocytes (granulated cells) have not been verified by the newer investigations since.

(a) Granules have been found in the lymphocytes by Michaelis and Wolff.² The granules were much fewer in number than in the ordinary granular cell. They used the Romanowsky method of staining.

(b) The lymphocytes have been found to possess amoeboid motion. (This is in confirmation of the statement of Deetjen, whose method was given in last year's review.)

(c) Observations have been made which speak for the possibility of an active lymphocytosis.

2. A cell which resembles the lymphocyte morphologically but which is capable of further differentiation is called by Michaelis and Wolff³ an "indifferent lymphoid" cell. This indifferent lymphoid cell of the bone-marrow can be distinguished in most stages of development from the lymphocyte.

3. Under normal conditions the part played by the individual organs of the hæmatopoietic system is as follows: The lymphocytes are furnished by the lymph-glands, the granulocytes by the bone-marrow, while the spleen, besides furnishing large mononuclear cells, exercises chiefly phagocytosis. In all these locations indifferent lymphoid cells are found which under certain conditions can act vicariously.

4. Through the investigations of Dominici it has been shown that myeloid changes occur in the spleen of animals (in anæmia from blood-letting, etc.), and in certain animals the spleen normally carries out a myeloid function. This myeloid transformation has been seen by Wolff in three cases—pernicious anæmia, lead anæmia, erysipelas, sepsis. In embryonal life the myeloid function of the spleen is generally conceded. (Hans Hirschfeld⁴ has reported the frequent occurrence of very numerous polymorphonuclear neutrophiles, less numerous neutrophile myelocytes, and normoblasts in the spleen after death from infections as scarlatina, diphtheria, etc. The changes in the lymph-glands were less marked. In heart disease, aneurism, apoplexy, only mononuclear, non-granular cells were found in the lymph-glands and spleen.)

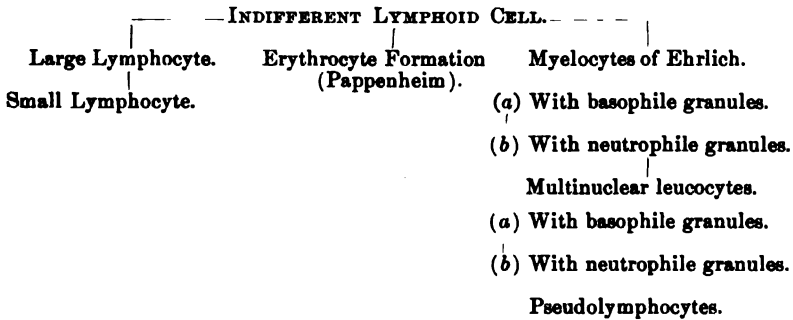
¹ Deutsche med. Wochenschrift, September 19, 1901.

² Virchow's Archiv, Band clxvii.

⁴ Berliner klin. Wochenschrift, 1902, No. 30.

³ Loc. cit.

5. From these investigations Wolff suggests the following scheme as to the blood formation :



6. Wolff believes that a transition from one form of leukæmia to another is possible.

7. The "large lymphocytes," which constitute a large portion of the leucocytes in cases of this character, show essential deviation from the character of the ordinary lymphocyte. The author thinks it justifiable to look upon such cells as stages in the development of the lymphoid cell, and classifies such cases under "lymphoid-cell leukæmia." He, therefore, recognizes three forms of leukæmia or refers two forms back to a single variety—lymphoid-cell leukæmia—from which the pure lymphatic or the pure myeloid can develop. While this is only a theory, so much appears certain that besides the legitimate forms of leukæmia there exists a transitional form or lymphoid-cell leukæmia.

8. Leukæmia is not a tumor formation with metastases, but there is a metaplasia of the hæmatopoietic organs arising from an unknown cause.

Pappenheim¹ gives a most elaborate account as to the genesis of the blood-cells which differs in but few particulars from that of Wolff. As bearing on the origin of the leucocytes may be mentioned the results of Rubinstein,² who studied the bone-marrow changes in animals following the artificial production of leucocytosis, and came to the conclusion that the production of leucocytosis is exclusively the function of the bone-marrow. These theories are by no means universally accepted, and are open to many objections on the ground of the great difficulty in recognizing the various slight differences between the cells from their staining peculiarities and morphological characteristics. The work of Flexner³ offers a new method of investigation that may lead to more accurate results. This observer, by obtaining leucotoxins for the spleen, lymph-glands, and bone-marrow has studied the pathological changes brought about in the organs of animals when injected by these

¹ Loc. cit.

² Zeitschrift f. klin. Med., Band xlii. p. 16.

³ University of Pennsylvania Medical Bulletin, November, 1902.

leucotoxins. His results are incomplete, but show that the bone-marrow reacts in a measure to lymphotoxin, and that the spleen and lymphatic glands as well as the bone-marrow respond to the myelotoxin.

MYELOGENOUS LEUKÆMIA. The chronic type of this disease is so well known that it need not be discussed. Concerning the acute variety Walz¹ has stated that no pure case has been reported. Ewing,² however, states that in 1897 he saw three rapidly fatal cases of leukæmia, all of the myelogenous variety. In two of the cases the blood was typical of the condition from the first examination and the marrow was puriform, while the spleen and the lymph-glands were but slightly affected. In the third case, at the first examination, there was a leucocytosis of ordinary inflammatory grade, and 5 per cent. of myelocytes. Eosinophile myelocytes and normoblasts were absent, and there was then no sufficient ground for the diagnosis of leukæmia. Later the leucocytosis and the proportion of myelocytes increased, and the provisional diagnosis of acute leukæmia was verified by autopsy.

Recently Hirschfeld and Alexander³ report a case of acute myeloid leukæmia which, however, fails to show the entire blood picture given as characteristic of this form of leukæmia by Ehrlich and Lazarus.

The patient was a male, aged twenty-one years, who had previously been in fairly good health, though somewhat pale. Alcoholism and venereal disease were denied. For a year he had complained of pain over the lower part of the sternum which was distinctly less at time of admission. For two weeks before admission there had been pain and swelling at the outer side of the right foot, and a week previous he began to have pain and swelling in the left lower jaw, which was not improved by removal of a tooth. Three days after the extraction an ulcer appeared on the inner surface of the lower lip, which grew rapidly. On admission (April 12, 1901) the patient showed the mouth condition just mentioned, and, though well nourished, was sallow and pale. The lungs and heart were normal. The liver and spleen were not enlarged. The cervical glands on the left side were swollen, and the inguinal glands were enlarged and hard. The temperature was normal and the urine negative. Blood examination: red cells, 2,000,000; hæmoglobin, 35 per cent.; no increase or qualitative change in the leucocytes. No nucleated red cells. Slight poikilocytosis, and some variation in the size of red cells. The pallor of the patient increased, though the ulcer in the mouth healed and pain in jaw was less. From May 8th to May 16th the patient complained of pain in jaws, and two teeth were drawn without relief. On the latter date a small, white

¹ See *PROGRESSIVE MEDICINE*, 1902.

² *Clinical Pathology of the Blood*, 1901, p. 212.

³ *Berliner klin. Wochenschrift*, 1902, No. 11.

elevation was noted on the mucous membrane of the lower lip. The blood examination gave the same results as before. On May 17th fever appeared, with morning remissions, and on the 22d retinal hemorrhages and white nodes on the retina were noted. On the 23d the spleen became palpable on deep inspiration, and on the 24th there was a distinct splenic tumor. On the 25th the leucocytes numbered 30,800, with marked increase of the lymphatic elements. Large and small lymphocytes and myelocytes were found, as well as occasional normoblasts. The condition gradually grew worse, and the patient died on June 9th. The leucocytes on the 6th numbered 64,000. At autopsy the spleen was enlarged, the intestinal lymph-glands swollen, as were the cervical lymph-glands. The bone-marrow was red. Microscopic examination of the bone-marrow showed numerous normoblasts and megaloblasts, large mononuclear white cells, very numerous myelocytes, rarely mononuclear and polynuclear eosinophiles. No "mast-zellen" were found. In the spleen the pulp was composed almost entirely of granular cells (myelocytes) as well as numerous true bone-marrow giant-cells. No "mast-zellen" were found. The spleen differed in no way from the microscopic picture of the bone-marrow myeloid transformation. The lymph-glands were almost the same as the spleen (myelocytes of all kinds, but no mast-zellen). The base of the ulcer on the lip was also composed of myelocytes sharply delineated from surrounding tissue. The only objection to the diagnosis as myeloid leukæmia is the absence of mast-zellen and eosinophiles in the circulating blood, and the authors believe that these are not so absolutely necessary to the diagnosis as Ehrlich and Lazarus state.

Under the title of "A Case Belonging to the Leukæmia-like Diseases," Michaelis¹ reports a case which in many respects resembles the one above, in a woman aged fifty years. When examined nothing important was found, except a distended abdomen, with enlarged liver and spleen. The lungs were normal except for a slight bronchitis; the circulatory, nervous, and urogenital systems were without abnormality. Glandular enlargement could not be detected. Two slight hemorrhages were noted in the left eye the day before death, otherwise there was no history or indication of hemorrhage. Blood examination: Red cells, 3,450,000; hæmoglobin, 40 per cent.; white cells, 16,000. Of the latter 20 per cent. were small lymphocytes; 56 per cent. large lymphocytes; 7.2 per cent. neutrophile myelocytes; 16 per cent. polynuclear neutrophiles; 0.4 per cent. eosinophiles; 0.4 per cent. "mast-zellen." In counting, 250 white cells and two normoblasts were found. Rarely a punctate erythrocyte was met, and one punctate normoblast. A few

¹ Zeitschrift f. klin. Med., Band xlv., Heft 1, 2.

mitoses in the lymphocytes were seen, and slight poikilocytosis was present. Blood-plates were normal as to form and number. In over two months' observation there was little change in the blood picture. The poikilocytosis increased, and later polychromatic cells became numerous and occasional punctate cells appeared. At first the number of nucleated red cells increased, but later entirely disappeared, and during the last fourteen days of life none were found. At autopsy the bone-marrow was red, and consisted almost entirely of giant-cells and lymphocytes, the myelocytes being much fewer in number. The spleen showed the same microscopic picture as the bone-marrow. Typical giant bone-marrow cells were found in the lymph-glands (which were not enlarged) and in the liver and kidneys.

This case represents, according to Michaelis, a border-line case between lymphatic and myelogenous leukæmia (similar to the form mentioned by Wolff, see above). He believes that the large lymphocytes are "indifferent lymphoid cells," while the myelocytes were evidently of a young variety, as their protoplasm was smaller than is ordinarily found. Leukæmia has been considered a return to the embryonal blood formation in which the cells found represent a stage through which they ordinarily pass, in the adult, to complete differentiation, but which stage is the highest that the leukæmic (embryonal) blood is capable of. In this case Michaelis thinks the same condition is present; the cells have not differentiated into the various forms of leucocytes that are commonly met with in the adult.

A case of leukæmia in which giant-cell emboli were found is also reported by Schwarz.¹ The white cells numbered 40,000, and the stained specimens showed myelocytes and normoblasts with positive and relative increase in the mononuclear elements and of the eosinophiles. At the height of the disease peculiar cells appeared which cannot be placed in any category. On autopsy an enlarged spleen and some enlarged lymphatic glands were found, together with moderate redness of the bone-marrow and osteosclerosis of the spongiosa and diaphyses. Lumpy masses of chromatin were found in the capillaries of the liver, kidneys, and spleen, which were apparently bone-marrow giant-cells which were found to be enormously increased in the marrow.

The author looks upon this as a possible beginning case of leukæmia, and thinks it gives support to the myelogenous theory of leukæmia.

The general tendency of all these investigations is to break down the sharp line of demarcation between the two chief forms. At present, however, our knowledge is too limited to admit of positive statements.

¹ Zeitschrift f. Heilkunde, 1901, Heft 11.

LYMPHATIC LEUKÆMIA. In last year's *PROGRESSIVE MEDICINE* this form of leukæmia was discussed somewhat at length, especially in regard to the relation in which the bone-marrow stood to this type of disease. Rosenfeld¹ summarizes the various definitions of chronic lymphæmia as follows :

1. Chronic lymphæmia is a primary disease of the lymph-glands which brings about the characteristic blood picture. The involvement of liver, spleen, and bone-marrow is secondary through the occurrence of metastases.

2. Chronic lymphæmia is a primary disease of the lymph-glands, but the characteristic blood picture occurs only after the bone-marrow shows lymphadenoid degeneration.

3. Chronic lymphæmia is a primary disease of the bone-marrow, which consists in a lymphadenoid degeneration. It can remain limited to the bone-marrow, or, secondarily, through metastases, lead to involvement of the lymph-glands, spleen, etc.

4. Chronic lymphæmia is a disease of the entire lymphatic tissue which pre-exists in all organs.

Rosenfeld reports three cases of chronic lymphæmia which, in view of the great rarity of this condition, are worthy of mention :

Case I. Woman, aged fifty-four years. She had gallstones with icterus and splenic tumor in 1890 and other attacks with passage of gallstones in 1894 and 1896. In 1896 she came to the clinic on account of pains in her limbs. In May, 1896, she showed pallor, large, hard liver, large spleen, enlarged glands at the elbows, inguinal regions, and neck. The blood showed a diminution of reds, but no increase in white cells. In August the glands became larger, and she complained of pain in the limbs. In September icterus appeared. She was admitted September 20, 1896. She was anæmic, with œdema of the legs up to the knees. Icterus was present, but no fever. Practically all the lymphatic glands were swollen, but they were soft and not painful. The liver extended a hand's breadth below the costal margin. Heart slightly enlarged ; sounds impure. The lungs were normal. Retinal hemorrhage was present.

Blood examination : Red cells, 1,210,300 ; white cells, 181,700, of which 91.8 per cent. were lymphocytes, 5 per cent. large mononuclear neutrophiles, 2.06 per cent. polynuclear neutrophiles, 0.6 per cent. eosinophiles. No mast-cells or transitional forms were present.

Patient developed a hydrothorax in July, 1897, which was tapped several times. In August, 1897, blood examination showed one white to five reds. Practically only the small lymphocytes were increased.

¹ *Zeitschrift f. klin. Med.*, Band xlii. p. 117.

The symptoms, œdema, etc., had increased, and she died December 1, 1897. The section was only partial, and no examination of the long bones was made, but the bone-marrow of the ribs was pale and unchanged. No lymphadenoid degeneration present.

Case II. Man, aged forty-two years. About September, 1898, the patient, previously healthy, began to have pain in the abdomen, chiefly localized in the left hypochondrium. Two weeks later the glands in the neck began to swell, and following this a tumor formed in the right axilla. These glands were not painful. The patient complained of weakness and lost flesh, although nutrition was sufficient. The tumor increased in size, and others appeared in the inguinal region. There were no hemorrhages or diarrhœa. He was admitted December 13, 1898. The patient was emaciated, with œdema of both feet. Pulse and temperature were normal. On the legs, abdomen, and both sides of the neck were large areas of brown pigmentation. There were masses of glands on both sides of the neck, in both axillæ, in inguinal regions. These were not sensitive or movable, and the skin was not adherent. The liver was palpable and a finger's breadth below the costal margin. Though hard there were no nodules. The spleen, while enlarged to percussion, was doubtfully palpable.

Blood examination : Red cells, 3,700,000 ; white cells, 117,000, of which 99 per cent. were small mononuclear lymphocytes, 0.05 per cent. polynuclears. No eosinophiles or large mononuclears. Hæmoglobin, 65 per cent. He was put on increasing doses of arsenic, and on January 4, 1899, the arsenic was stopped. The tumors in the neck and axilla were smaller, those of the inguinal region remained unchanged, and his general condition was not improved. Blood showed 3,800,000 red cells, 145,000 leucocytes (small mononuclear lymphocytes). He died January 24, 1899.

Section showed the large glands to be non-adherent. On the sternum beneath the periosteum was a deposit of material resembling the gland tissue, about 3 mm. in thickness. Spleen weighed 370 gm. The capsule was thickened ; cut surface smooth ; the color light red, with almost no follicle trabeculæ in it. Liver a hand's breadth below the costal margin. The heart and lungs were normal. The periosteum on the ends of the ribs showed numerous ecchymoses, while in the humerus and femurs were tumors partly translucent in composition and partially gray. No tumors were found in the vertebræ.

Pathological diagnosis : Malignant lymphoma of all lymph-glands, lymphosarcomatous infiltration of the bones.

Case III. Man, aged fifty-four years. Admitted February 27, 1900. For four years the previously healthy patient noticed an enlargement of the lymph-glands of the neck and axilla. These were

small in the beginning and never painful. During three or four months previous to admission the growth of the glands was very rapid. Simultaneously the patient complained of loss of strength and dyspnoea on exertion. No hemorrhages had been noted. The patient was pale but muscular, and with a small amount of subcutaneous fat. Small areas of brown pigmentation were noted on the breast and back, but no œdema. In the supraclavicular regions, both sides of neck, axilla, and inguinal regions there were numerous, rather hard, non-painful, non-fluctuating glands lying snugly in pockets. The spleen was enlarged and palpable to three fingers below the ribs. The liver was palpable four fingers below the ribs, sensitive to pressure. The heart was normal.

Blood examination: Red cells, 1,947,100; white cells, 455,900, of which 98 per cent. were small mononuclear lymphocytes, 0.2 per cent. large mononuclear lymphocytes, 1 per cent. polynuclear leucocytes, 0.8 per cent. eosinophiles; no mast-zellen. Death occurred March 24, 1900.

Section showed, besides the enlargements already noted, enlargement of the lymph-glands of the entire mesentery of small intestines, especially marked at the commencement of the mesentery at the vertebral column. Numerous lymph-glands were present in the gastrocolic ligament. The periosteum on the outer wall of the second and third ribs was thickened, reddened, and easily separated. There were numerous enlarged glands in the mediastinum. The gland capsules were nowhere perforated. The spleen weighed 630 gm.; had large lymph-glands of hilus; the pulp was bluish-red in color, and the Malpighian bodies apparently enlarged. The liver weighed 3360 gm. The cut surface showed a few white nodules. The bone-marrow showed lymphadenoid degeneration.

From his cases the author thinks the following can be said: The primary disease of the lymph-glands, the existence of which cannot well be denied, presents an aleukæmic preliminary stage (Vorstadium) (Case I. and perhaps Case III.), or causes an increase entirely or predominantly of the small lymphocytes (Case II.) when the disease has assumed a wide extent. The added disease of the bone-marrow causes, when of sufficient extent, a change in the blood picture which concerns the form of the lymphocytes. It can also show itself by the onset of severer clinical symptoms (Case III.).

A diffuse involvement of the bone-marrow appears always to involve a progressive course for which speaks Case III. As already mentioned, the lymph-gland involvement had existed three to four years without severe clinical symptoms. It is unlikely that the diffuse disease of the bone-marrow had existed so long without evidences. The supposition is justifiable that after a three years' existence of the lymph-gland tumors the sudden outbreak of the severe symptoms was produced by

the additional involvement of the bone-marrow. The time preceding the outbreak of symptoms can be looked upon as an aleukæmic, though not proven, because no blood examination was made.

Concerning the question whether every leukæmia, including the lymphatic forms, is primarily myelogenous, as believed by Pappenheim, Cases II. and III. speak against this theory. The manner in which the bone-marrow was found to be involved gave no foundation for the belief that it was the primary site. The long existence of the lymph-gland tumors in Case III. and the aleukæmic stage in Case I. also speak against primary bone-marrow involvement.

The clinical division of cases of leukæmia into myelogenous, chronic lymphatic, and acute leukæmia, advocated by Naunyn, appears to the author to be sufficiently complete. In the expression lymphatic leukæmia the word "lymphatic" should not be used to mean that the disease of the lymph-glands alone causes the blood picture, but lymphatic tissue generally no matter where it occurs.

ACUTE LYMPHATIC LEUKÆMIA WITHOUT ENLARGEMENT OF THE LYMPH-GLANDS. A case of this kind is reported by Reed.¹ The patient was a man, aged fifty years, a gardener by occupation, who had always been healthy. He was a heavy drinker, but denied venereal infection. Six months previous to his death he had a severe hemorrhage from the nose, from which time he became noticeably pale. Three and a half weeks before death he called in a physician on account of another nasal hemorrhage. Nothing abnormal was noted except extreme pallor, marked dyspnœa, and a small subcutaneous hemorrhage over the left fibula. The temperature was normal. The blood showed an enormous increase of leucocytes, but no actual count was made. At autopsy the anatomical diagnosis was made of lymphatic leukæmia, bronchopneumonia, and œdema of the lungs. The chief points of interest are the spleen, lymph-glands, and bone-marrow. The spleen measured 13 x 10 x 6 c.m.; was of firm consistency; pulp grayish-red; Malpighian bodies visible, but somewhat diffuse. The lymph-glands were not specially enlarged. The bone-marrow was homogeneous, deep red in color, soft, and diffuent. Smears of blood from the vena cava and heart showed only three or four polymorphonuclear granular leucocytes among over a thousand non-granular, mononuclear cells. Four normoblasts were seen. Of the mononuclear cells two forms were noted—large and small—with intermediate variations. The nuclei of the large cells were round or slightly oval, stained faintly, and showed a definite nucleolus and intranuclear network. The protoplasm was considerable, non-granular, and took a

¹ American Journal of the Medical Sciences, October, 1902.

faint acid stain. Double nuclei were seen, but no mitoses. The small mononuclear cells had a small amount of protoplasm which stained faintly with acid stain and a deeply staining, usually homogeneous nucleus. Microscopically the bone-marrow showed congestion and hemorrhage, with a few normoblasts and no megaloblasts. The most numerous cells were the small mononuclear forms just described, and a cell resembling a typical lymphocyte. These divided amitotically. Large mononuclear cells with oval nuclei and basophilic granules; large lymphoid cells with rather pale nuclei and non-granular protoplasm, and non-granular cells with irregular nuclei were seen. The myelocytes were diminished, as were the giant-cells. The lymph-glands showed evidence of proliferation. In the spleen there was marked congestion and an increase of nucleated cells in the pulp. There was no evidence of hyperplasia in either lymph-glands or spleen. Reed thinks the case is one of lymphocytosis arising from proliferation of lymphoid tissue in the bone-marrow, and death occurring before any other organ in the body showed involvement. He believes in the origin of the lymphocyte from the bone-marrow under certain conditions, and also suggests that acute leukæmia, lymphatic and myelocytic, is due to bone-marrow changes, the other hæmolytic organs being secondarily involved.

LEUKÆMIA AND CHLOROMA. The blood conditions characteristic of chloroma resembles so closely that of lymphatic leukæmia that its mention here is justifiable. Dunlop¹ reports a case in a boy aged five years. When first seen, September 30, 1901, there was pallor, exophthalmus, numerous petechiæ, and a few enlarged inguinal and cervical glands. The blood examination showed the hæmoglobin to be 32 per cent.; erythrocytes, 800,000; white cells, 24,500, of which 73 per cent. were large and small lymphocytes, the larger predominating; 17 per cent. polymorphonuclear; 5 per cent. myelocytes; 5 per cent. unclassified. A few nucleated red cells were seen. On October 22d a rounded non-nodular swelling appeared on both temporal regions, and the diagnosis of chloroma was made. The tumors increased in size, with progressive diminution of the red cells and increase of the white cells, the latter reaching 123,000. The boy died on November 16th. Autopsy revealed the spleen to be firm, with enlarged Malpighian bodies; enlargement of the mesenteric glands, one or two being greenish; the bone-marrow of the femur was a bright green color. The lymphoid tissue throughout the intestines was increased. Greenish masses were found scattered throughout the internal organs excepting the brain and spinal cord, and invading the marrow and periosteum of the bones. Dock has previously called attention to the resemblance

¹ British Medical Journal, May 3, 1902.

between chloroma and leukæmia. Dunlop believes that chloroma is probably a form of lymphosarcoma. Of the twenty-seven cases he has been able to collect all showed marked lymphocytosis. Bramwell¹ reports a case in a man, aged twenty-five years, which he believes to be chloroma. The patient showed an eruption of flat-topped nodules of varying size on the trunk, arms, and head. These were confluent in places and produced a raised uniform infiltration of the skin; they were painless, non-adherent, and for the most part of a slaty-gray or purple-gray color. Some were yellow in the centre. The gums were hard, swollen, and dark purple in color. The conjunctiva was infiltrated with a translucent, fleshy-looking growth, in which ramifying vessels were seen. The epiglottis and larynx were greatly swollen, the swelling being due to lymphoid infiltration. The blood showed 8000 white cells, of which 95 per cent. were lymphocytes. He believes that no hard-and-fast line can be drawn between chloroma and acute lymphatic leukæmia. While the blood picture above may result from more than one pathological condition, practically it is found only in chloroma and lymphatic leukæmia.

Similar cases are mentioned by Sternberg and by Türk.² Both are of the opinion that chloroma is a lymphosarcoma, though not in the sense that there is a new formation—a true tumor—but rather a hyperplasia of the lymphatic tissue. Türk suggests that chloroma may form the connecting link between lymphosarcoma and lymphatic leukæmia.

From the foregoing it will be seen that the diagnosis in many cases is difficult, and even after a careful study of the blood and other clinical manifestations the proper classification may not be possible on account of the various atypical cases that occur.

TREATMENT. Rudolph³ reports a case of chronic lymphatic leukæmia with marked glandular enlargement in which improvement was obtained by the use of aspirin. The dose is not given, but the patient thought the glands were smaller and that she had gained in weight.

A possible form of treatment is suggested by Franke.⁴ The patient had lymphatic leukæmia, with marked glandular involvement. The leucocytes numbered 392,500, of which 4 per cent. were polymorphonuclear neutrophils, 78 per cent. small mononuclears, 17 per cent. large mononuclears, 1 per cent. transitional. Franke removed a gland under aseptic precautions, and from an emulsion made from it injected a rabbit intraperitoneally five times at intervals. The serum thus obtained was mixed with the fresh blood of the patient and examined

¹ Edinburgh Medical Journal, March 1, 1902.

² Wiener klin. Wochenschrift, November 2, 1902.

³ Münchener med. Wochenschrift, 1902, No. 23.

⁴ Centralblatt f. innere Med., February 8, 1902.

in hanging drops. The changes were as follows: The cells became less distinct, abnormally transparent, and the edges were irregular. The smaller forms were first affected, the larger cells later, and the change continued until only a finely granular mass remains. It required eight hours to reduce completely the small cells and twelve hours for the large cells. Control tests of the leukæmic blood alone and with normal rabbit serum showed no change. Franke was unable to try the serum on his patient on account of his low condition, but intends to employ the serum when a suitable case presents itself, and suggests the possibility of a similar procedure in cases of sarcoma.

Hodgkin's Disease. Much has been written in the past year concerning the symptom-complex of general enlargement of the lymphatic glands with or without splenomegaly, and known under the various names of Hodgkin's disease, pseudoleukæmia, malignant lymphadenoma, etc. The studies have been made along two general lines—first, as to the relation which tuberculosis bears to the condition, and, second, as to the relation existing between this glandular enlargement and true leukæmia.

For a number of years cases have been reported from time to time in which tuberculosis of the glands simulated pseudoleukæmia. Sternberg's article, in 1898, "*Ueber eine eigenartige, unter dem Bilde der Pseudoleukæmia verlaufende Tuberculose des lymphatischen Apparates*," directed especial attention to this connection. Sailer¹ has carefully reviewed the literature of this phase of the subject, and has reported four cases which he thinks illustrate the causal relation in which the tubercle bacilli stand to pseudoleukæmia. Sailer does not come to any definite conclusion, but evidently considers that with increasing knowledge practically all such cases will be found to be tuberculous. The four cases which he reports are not at all convincing, for in only one of them were the superficial glands enlarged, and this enlargement was slight, while the enlarged cervical glands which are generally accepted as characteristic were not present.

In reviewing the literature Sailer has found only Sternberg who seems to favor the idea that Hodgkin's disease is always tuberculous, and he (Sternberg) is not dogmatic. Though tubercle bacilli have been found in the enlarged glands of pseudoleukæmia, this does not prove that the bacilli stand in a causal relation, as there is no reason why the lymph-glands of Hodgkin's disease may not become secondarily infected. This view is held by Schmalz, Hoster, Fisher, and others. Stengel, Frölich, Liebmann, and other writers who have discussed this subject in the past decade admit the tuberculous nature of some cases of pseudoleukæmia, but they insist that the disease can also be produced by

¹ Philadelphia Medical Journal, April 12 and 19, 1902.

other and hitherto undiscoverable causes. Sailer suggests that in pseudoleukæmia we may have to do with a variety of tubercle bacilli which differ from that ordinarily infecting human beings, but this will require proof. He believes that the majority if not all cases of pseudo-leukæmia will ultimately be recognized as tuberculous in nature.

My own view regarding the tuberculous nature of Hodgkin's disease has always been that certain cases of tuberculous lymphadenitis are clinically indistinguishable from true Hodgkin's disease; that in some instances of Hodgkin's disease terminal or intercurrent tuberculous infection may occur, but that the tuberculous nature of the great majority of cases is, to say the least, unproved.

Musser,¹ in discussing "Rückfall" fever, comes to the conclusion that Hodgkin's disease is in all probability a lymphatic tuberculosis. The two cases forming the basis of this paper did not come to autopsy, and are not so instructive as the case of Schur.

Schur² reports a case in which the post-mortem showed widespread tuberculosis of the lymphatic apparatus. The patient, a girl aged twenty-five years, at the time of demonstration (December, 1901) looked cachectic. She was emaciated, with œdematous eyelids and marked œdema of the lower extremities. She had numerous large and small lymphomata, either separate or combined with tumors in both supraclavicular fossæ, both axillæ, and both inguinal furrows. The liver was swollen, reaching to the umbilicus, and the spleen hard and projecting beyond the costal margin. The urine contained much albumin and casts. The eye-grounds were normal. Blood examination: Red cells, 4,100,000; white cells, 50,000; hæmoglobin, 50 per cent. Of the leucocytes 22 per cent. were polymorphonuclear neutrophiles, 0.5 per cent. eosinophiles, 2 per cent. transitional, 5 per cent. lymphocytes, 0.5 per cent. mast-zellen. No "mark-zellen" and no nucleated red cells were found. The patient had been under observation for about two years, and when first seen there was only a slight swelling of the lymph-glands in the left supraclavicular fossa with a dulness under the manubrium. The blood examination at this time showed besides some anæmia 30,000 white cells, of which 5 per cent. were eosinophiles, 8 per cent. lymphocytes, and the remainder polymorphonuclears. No nucleated red cells and no "mark-zellen." With the appearance of fever the condition of the patient grew worse. The lymph-glands in the left supraclavicular fossa became smaller, while those in the right became distinctly swollen. Blood examination, made on January 12, 1900, showed a leucocytosis of 240,000, of which practically all were polymorphonuclears, there being only 3 per cent.

¹ American Medicine, January 4, 1902.

² Wiener klin. Wochenschrift, 1902, Nos. 2 and 24.

lymphocytes and almost no eosinophiles. After some weeks, in which the condition was grave and during which new glandular enlargements appeared in the axillæ, the patient grew better under arsenic, the glands became smaller, and the fever disappeared. Blood examination on August 15, 1900, showed only 18,000 leucocytes (11 per cent. lymphocytes, 1 per cent. eosinophiles, 2 per cent. "mast-zellen"). In October the condition again became bad and fever reappeared. The glands again became swollen and with attacks of intense pain recurring daily, glandular enlargement appeared in the inguinal regions. The leucocytes now numbered 40,000. From then on there was a gradual increase in the severity of the disease, with occasional periods of interruption. Enlargement of the liver and spleen and the nephritis appeared first in the fall of 1901. At this time it was thought that the blood examination excluded lymphosarcoma, gland tuberculosis, pseudoleukæmia, anæmia splenica, chronic "Rückfallsfieber," as well as lymphæmia and myelæmia. The autopsy showed pseudoleukæmia on the basis of a chronic tuberculosis of all the peripheral lymph-glands with fibrous induration of the same. Pseudoleukæmic splenic tumor with chronic tuberculosis of the same in the form of numerous and in part caseated nodules. Pseudoleukæmic nodes were present in both lungs. Amyloid degeneration of liver, spleen, and kidneys was also present. In the microscopic preparation were found the large, peculiar cells said to be characteristic by Sternberg. Besides this there were genuine tubercles with Langhan's giant-cells, and tubercle bacilli could be demonstrated. The amyloidosis of the liver, spleen, and kidneys has not hitherto been noted in the cases of "tuberculous pseudoleukæmia."

Türk,¹ in discussing the above, objects to the name tuberculous pseudoleukæmia as tending to add additional confusion to the conception of pseudoleukæmia. In regard to the blood findings, Türk has observed three groups of cases: 1. Those in which the leucocytes were approximately normal both as to absolute and relative numbers. 2. Those showing a leucopenia of different grades. 3. Those in which, from the clinical symptoms, without consideration of the blood findings, a tubercular affection of the glands had to be diagnosed. He often found a distinct leucocytosis of the ordinary neutrophilic type, which was often from 15,000 to 20,000, and in one case 38,000. Certain clinical symptoms Türk thinks are of more service in diagnosing the general lymph-gland tuberculosis than the blood picture. These are: 1. Fever. While not all, yet in the majority of cases of so-called pseudoleukæmia where there is elevation of temperature and especially of the hectic type, the condition is to be looked upon as tuberculous. Türk has never

¹ Wiener klin. Wochenschrift, 1902, Nos. 2 and 24.

seen a case of true hyperplastic lymphomatosis with such a character of fever. There is no doubt, however, that tuberculous lymphoma may exist for a long time without fever; so the symptom is only valuable when positive. 2. Tenderness is characteristic of tuberculous glands. 3. Node-like swellings of the lymphatic apparatus in the mucous membrane, especially of the mouth and throat, he has never seen in the tuberculous affection, while they are very common in true hyperplastic lymphomatosis. He does not agree with Pinkus that true pseudoleukæmia always shows a relative lymphocytosis. He has seen two cases conformed by autopsy in which no lymphocytosis was present, though the clinical course and the histological findings were identical with genuine so-called pseudoleukæmia. Türk would classify these hyperplasias of the lymphatic apparatus as follows: 1. General hyperplastic lymphomatosis without local aggressive character and without lymphocytosis. 2. Lymphomatosis with local aggressive character (lymphosarcoma); as a rule, without lymphocytosis. 3. Lymphomatosis with slight "ausschwemmung" of the cellular elements of the hyperplastic tissue, therefore with a relative lymphocytosis. 4. Lymphomatosis with marked "ausschwemmung" of the new-formed cells in the blood-lymphatic leukæmia.

As exponents of the belief that Hodgkin's disease is a distinct affection and not of tuberculous nature may be mentioned Webb¹ and Reed.² The latter has reported very fully the clinical and pathological findings in eight cases of Hodgkin's disease, in five of which tuberculin was tried, and three of the patients came to autopsy. Of these cases seven were white, one colored. Seven cases were in boys under seventeen years of age, two of them being only five years. One was a woman, aged fifty-five years. A family history of tuberculosis was given in two and denied in five. The initial growth was in the cervical region in all but one, where the growth was first noted in the episternal notch. In all of these cases the large external tumor masses were in the cervical region. The axillary glands were usually enlarged on the same side as the tumor; the inguinal glands were not markedly increased in size in any of the cases. The duration of the growth varied from two to seven years. In four of the cases the rapidity of the growth had become greatly increased during the last months. The blood showed grave secondary anæmia in two cases. The leucocytes in seven cases counted showed no relative increase. Differential counts in seven cases showed a relative and absolute increase of lymphocytes in two. In two other cases these cells were notably few in number. Otherwise the blood-counts were normal. The spleen was palpable in three cases, and in

¹ British Medical Journal, September 17, 1902.

² Loc. cit.

one the liver was enlarged. All cases showed a slight irregular fever with occasional exacerbations. One case gave a history of recurring fever with chills and sweats. Tuberculin was given in five cases without reaction. Five cases died and three came to autopsy. In one case there was a generalized miliary tuberculosis which from the history was evidently a terminal infection. No sign of tuberculosis was found in the other two cases. The cervical, bronchial, mediastinal, and abdominal glands were involved in three cases, and in the three metastases in the spleen were found. Metastases were found twice in the liver and once in the pericardium, but in no other organs. Reed is of the opinion that the diagnosis of Hodgkin's disease can be made from tuberculosis even when the two processes are present, as in the case above referred to. The special features are the peculiar giant-cells and the frequent excess of eosinophiles in the specimen. Reed's conclusions are: 1. We should limit the term Hodgkin's disease to designate a clinical and pathological entity, the main features of which are painless progressive glandular enlargement, usually starting in the cervical region without the blood changes of leukæmia. 2. The growth presents a specific histological picture, not a simple hyperplasia, but changes suggesting a chronic inflammatory process. 3. The microscopic examination is sufficient for the diagnosis. Animal inoculation may confirm the decision by its negative results. 4. Eosinophiles are usually present in great numbers in such growths, but not invariably. Their presence strengthens the diagnosis. 5. The pathological agent is as yet undiscovered. Tuberculosis has no direct relation to the subject.

A slightly different view of pseudoleukæmia is taken by Jünger,¹ whose two cases are briefly given:

Case I. Man, aged forty-nine years, with a fist-sized, hard, glandular tumor on the right side of neck, extending to the axilla, where there was a tumor the size of two fists. On the left side of the neck and in the left axilla there were smaller packets of glands. The heart and lungs were negative. Blood was negative. The right pulse was stronger than the left, and the pupils unequal (mediastinal tumors shown by X-ray). Under arsenic the condition grew worse for a few weeks, and for a period of two weeks there was a glycosuria amounting to 0.5 per cent. Then began a gradual improvement under the continued use of arsenic until at the time of demonstration only a few small glands could be felt in the neck and the axilla. As a result of the arsenic there was a tremor of the hands and slight pigmentation of the skin.

The author has found no cases of pseudoleukæmia recorded in which glycosuria occurred as a complication. (A similar case, however, is reported by Goldsmidt.²) He calls attention to the importance of long-

¹ Münchener med. Wochenschrift, 1902, No. 9.

² Ibid., 1901, No. 40.

continued use of arsenic in such glandular tumors. There are cases recorded in which improvement appeared first after 4 gm. (5j) arsenious acid had been given in a period of eight months, and another after 13 gm. (5iijss) in two years.

Case II. Woman, aged sixty-seven years, first seen in May, 1901, with a heart lesion. Besides this she had an enormous splenic tumor which she claimed had existed twenty years. The blood examination showed slight anæmia with no leucocytosis. After a period in which the case progressed favorably (November 29, 1901), she had frequently attacks of epistaxis, as a result of which she became very cachectic. Blood examination: Red cells, 2,400,000; white cells, 80,000. Microscopic examination revealed many nucleated red cells; the white cells were composed almost entirely of mononuclear neutrophils of all sizes—therefore, a myelocytic leucocytosis. In the next few weeks the anæmia grew worse (920,000) and leucocytosis better (5,000); later the anæmia improved (2,800,000, 3,100,000, 3,200,000) and the leucocytes increased (20,000, 26,000, 72,000).

Jünger would call true pseudoleukæmia "lymphomatosis," as Türk does, and considers the essential feature a primary involvement of the lymphatic apparatus—lymph-glands, spleen, and follicles. This may be unilocular, or with involvement only of the neighboring glands, or multiple. After the manner of metastases lymphoma can appear in all organs, even the bone-marrow. The spleen may be affected alone. Under the heading of "Lymphomatosis" he would not include multiple tuberculous lymphoma, Ebstein's intermittens, in so far as tuberculosis is causal, multiple glandular enlargement due to syphilis, anæmia with isolated (Stauungsmilz), persistent splenic tumor after infectious diseases, especially malaria, and Banti's disease. To it, however, belong the pseudoleukæmia infantum splenica of von Jaksch and the "anæmia splenica" of the adult, in so far as they are pure cases and not combined with rachitis, hereditary lues, or the previously mentioned diseases.

He concludes: 1. The term pseudoleukæmia can scarcely be retained clinically. We recognize a disease of the lymphatic apparatus that after Türk he names lymphomatosis. This is divided into an aleukæmic and a leukæmic stage. 2. Under leukæmia is understood a disease of the blood itself that occurs not only by lymphomatosis, but in other diseases as a complication. The direct cause is unknown. For the diagnosis of a lymphomatosis is the course of the disease, not the present status.

The opinion of Jünger, who looks on the blood as a fluid tissue and who considers that in leukæmia the increase of cells takes place within the circulation, is not generally accepted. There is, however, a tendency to connect the two conditions—pseudoleukæmia and lymphatic leukæmia—with each other. Jünger has collected ten cases in which an aleu-

kæmic stage was shown to precede the leukæmic stage. The case of Wende, quoted last year, is a case in point. Many authors incline to the belief that the leukæmic stage appears only when there is secondary involvement of the bone-marrow, which in a measure is borne out by the fact that in all cases of lymphatic leukæmia the bone-marrow is found to be involved. Thus, while a relative lymphomatosis may be produced by "ausschemmung" of cells from the hyperplastic tissue, true lymphæmia is thought to indicate bone-marrow involvement. Pappenheim¹ gives a very ingenious tabulation showing the relation between the two chief forms of leukæmia and the various forms of pseudoleukæmia :

(A) Lymphocytic leukæmia.

- (a) Primary myelogenous pseudoleukæmia (myeloma) → lymphadenoid bone-marrow change → lymphocytic leukæmia → { splenic tumor, gland tumors.
- (b) Primary { lymphatic } pseudo-leukæmia { → anæmia lymphatica } → { lienal } { → anæmia splenica } → lymphadenoid or splenoid bone-marrow change → lymphocytic leukæmia.

(B) Mixed-cell leukæmia.

- Primary myeloid hyperplasia of the bone-marrow → mixed-cell myelæmia { → splenic tumor. } { → gland tumors. }

Splenic Anæmia. Considerable attention has been paid to the condition variously described as splenic anæmia, Banti's disease, splenomegaly, etc. The majority of writers recognize the condition as a group of symptoms (with splenomegaly as the most important one) provisionally classified as a disease. My own opinion regarding splenic anæmia is that it represents a group of possibly varying pathological conditions and that the splenic enlargement is secondary in nature. The cases of Debove and Bruhl and of Bovaird must, of course, be excepted. These were entirely different in pathology from others examined post-mortem.

Osler,² whose former paper on this subject was considered in PROGRESSIVE MEDICINE of 1900, has again discussed the question, fully agreeing in the main with Rolleston. To the fifteen cases reported two years ago Osler has added three new ones, which may be briefly described :

Case I. Man, aged thirty-four years, who had an enlarged spleen and marked pallor for nine years, during which time there occurred four severe attacks of hæmatemesis. The spleen was removed, but the hemorrhage was uncontrollable, and the patient died. No autopsy was obtained. In this case there was a history of malaria during boyhood. The spleen was of great size, but the liver was not enlarged.

¹ Loc. cit.

² American Journal of the Medical Sciences, November, 1902.

Case II. Woman, aged forty years, with a history of malaria eighteen years previously, and a tumor of the left side for eleven years.

In 1898 an attack of severe anæmia with ascites followed by recovery; in 1900 a second attack with jaundice, anæmia, and ascites, gradual recovery; in 1901 a third attack with jaundice, ascites, and profound anæmia; recovery.

Besides the malarial history of eighteen years previous, she had chills and fever in 1890, and these recurred for several years. The mass on the left side was noticed first in 1890. In all three attacks the liver was found enlarged.

Case III. Man, aged thirty-three years. Chills and fever sixteen years previous. Went to Mexico, and while there was jaundiced and sickly for eight or nine months. On his return, fifteen years ago, was told that he had an enlarged spleen, which has since persisted. He does not think it has increased much in size since first noticed. He has been pale for years, and has had occasional attacks of pain and a sense of discomfort after eating. Of late he had had a cough with fever and sweats. On admission he was found to be sallow, with numerous areas of pigmentation over the face and forehead and distinctly jaundiced. The lungs were negative and the heart not enlarged. The spleen extended 12 cm. below the costal margin and the liver 4 cm. For five days the temperature ranged between 100° and 101° , and there was a soft friction murmur in the axilla. Examination of sputum was negative. He gradually improved, and the jaundice lessened, but there seemed to be a general increase in the pigmentation of the skin.

These cases show the general characteristics of the symptom-complex to which the name splenic anæmia is given, and it is defined by Osler as follows:

"Anæmia splenica chronica (is) a chronic affection, probably an intoxication of unknown origin, characterized by a progressive enlargement of the spleen, which cannot be correlated with any known cause as malaria, leukæmia, syphilis, cirrhosis of the liver, etc. (primary splenomegaly); anæmia of a secondary or chlorotic type (leucopenia); a marked tendency to hemorrhage, particularly from the stomach; and in many cases a terminal stage with cirrhosis of the liver, jaundice, and ascites (Banti's disease)."

Symptomatology. The special symptoms indicative or diagnostic of the disease are classified under six headings by Osler.

1. The remarkable duration of the disease. In his fifteen cases the disease lasted more than ten years in seven and more than four years in eleven.

2. The *splenomegaly*. The special feature is the size, which is only equalled in leukæmia. The average weight in twelve cases collected

by Rolleston was sixty-one ounces. The apparent comfort of the patients with these enlarged spleens is remarkable.

3. *Hæmatemesis*. Eight of his cases had vomiting of blood. This hemorrhage in a large proportion of cases is due to conditions associated with the enlarged spleen and not to accompanying cirrhosis of the liver. As sources of the blood may be (a) general diapedesis from gastric mucosa ; (b) small erosions of gastric mucosa ; (c) rupture of a varicose vein of the œsophageal plexus ; (d) Rolleston suggests that a large wandering spleen may pull on the gastrosplenic omentum, may give rise to narrowing of the veins, or cause a kink in the splenic veins and so induce intense venous engorgement of the stomach. Hemorrhage from other sources is less frequent ; epistaxis, retinal hemorrhages, bleeding gums, menorrhagia, hæmaturia, and purpura may occur.

4. *Anæmia*. This may be slight in well-defined cases and possesses no distinctive features, being of the secondary or chlorotic type.

(a) The reduction in the red cells is moderate. In forty-one cases the average was 3,245,000, the highest being 5,200,000 and the lowest 2,187,000.

(b) The low hæmoglobin is rather more striking than in other secondary anæmias. Average of thirteen hæmoglobin counts was 47 per cent.

(c) Leucocytes, as a rule, are diminished. Immediately after profuse hemorrhage or at the terminal stage there may be an increase. The average in thirteen cases was 3850. (A case of Breuer¹ showed only 1800 leucocytes to the c.cm, the protoplasm of cells being normal.)

5. *Pigmentation of the skin* was present in eight of his cases. This resembles that seen in Addison's disease, but is rarely so intense. This has been noted by Brill, Bovaird, and others.

6. *The hepatic features*. Three types of cases may be noted.

(a) The majority of cases present no symptoms of disturbed action of the liver ; (b) in a second group the occurrence of ascites even when the liver is normal suggests cirrhosis ; (c) in a third group the hepatic features so predominate that cirrhosis of the liver is at once suspected.

In Osler's series ascites occurred four times and jaundice twice.

Rolleston² reports a case in a man, aged twenty-three years, in whom the condition had existed for twelve years, during the last three of which he had had repeated attacks of hæmatemesis. The spleen was greatly enlarged, and there was marked weakness with anæmia of the chlorotic type and a diminution in the number of leucocytes. Though the patient improved under treatment, splenectomy was advised as

¹ Wiener klin. Wochenschrift, 1902, No. 33.

² Clinical Journal, April 16, 1902.

a curative remedy. Death occurred two days after operation. A peculiar symptom in this case was the presence of a continuous bruit over the spleen, most marked when the breath was held. A second case shows a somewhat similar picture. The patient was a girl, aged sixteen years, with grave anæmia, who gave a history of monthly hæmatemesis for nearly a year. When first seen the spleen was enlarged, but there was no glandular involvement. Later on the lymphatic glands increased in size, and she reacted to tuberculin. On account of the glandular enlargement (which does not appear in splenic anæmia) and the reaction to tuberculin a diagnosis of tuberculosis of the spleen was made. It was noted that the urine passed by this patient when in the recumbent position contained albumin, while that passed when she was up and about was free from albumin. This Rolleston attributes to interference with the renal circulation by the enlarged spleen.

Before taking up the pathology and etiology of this condition it may be well to discuss the relationship between splenic anæmia and Banti's disease. In the main the names can be used synonymously, the distinction being that Osler, Rolleston, and others look on Banti's disease as the final stage of splenic anæmia when cirrhosis of the liver has been added to the condition. Murrel¹ insists that Banti in his original article does not mention cirrhosis of the liver, but speaks of "tumefaction of the liver and spleen and of idiopathic hypertrophy of these organs." According to Murrel, the essential features as described by Banti are: 1. A progressive idiopathic anæmia. 2. Grave disturbances of the organic functions. 3. Irregular fever. 4. Hemorrhages. 5. Fatal termination. While Murrel believes splenic anæmia to be the same condition as Banti's disease, a case reported by him² does not accord with the views held by most authors in reference to the disease as represented by either name. The patient was a woman, aged thirty-one years, who had always been well and who gave no history of alcoholism, syphilis, malaria, or hæmophilia. When admitted, January 16th, she gave a history of hæmatemesis coming on without premonitory symptoms three days before, during which three pints of clotted blood were vomited. When seen her temperature was 101° to 102.4°, pulse 156. The stomach was not painful, the liver was not enlarged, heart and lungs negative, as was the urine examination. The spleen was palpable. For two days the stools contained blood. The case was thought to be gastric ulcer. On January 21st the blood showed 362,000 red cells, 4375 white cells, with hæmoglobin 20 per cent. On the 25th the red cells amounted to 1,080,000, the white cells 4375, the

¹ Clinical Journal, August 6, 1902.

² Lancet, April 26, 1902.

latter consisting of finely granular cells, 78 per cent. ; coarsely granular, 1 per cent. ; hyaline, 12 per cent. ; lymphocytes, 9 per cent. Though apparently no further hemorrhages occurred, the patient failed to improve, and died on January 29th. The autopsy revealed no abnormality of the stomach or other organs excepting a marked anæmia. The lungs were oedematous. The spleen weighed nine ounces, was dark red in color, and looked beefy and homogeneous. Sections of the spleen under the microscope showed the connective tissue to be much thickened generally. Murrel believes this to be a case of acute Banti's disease, though pernicious anæmia is not absolutely excluded. As the cardinal feature of anæmia with splenic enlargement is its marked chronicity, it is difficult to understand how this case can be so classified.

PATHOLOGY. The histological changes of the spleen may be of two kinds according to Osler.¹

1. A fibrosis and hyperplasia, with atrophy of the pulp and a hyaline degeneration of the Malpighian bodies (Banti); Osler's cases corresponded to this with minor differences. 2. In certain cases which give the same clinical symptoms the normal texture (of spleen) is largely replaced by fibrous tissue and large endothelial cells with clear protoplasm containing two or more nuclei, and among them giant-cells. Gaucher has described this as primary endothelioma, though his case had had enlarged spleen for twenty-five years. This condition has been observed by Bovaird, Rolleston, and others. Bovaird suggested that the proliferated endothelial cells eventually form fibrous tissue, but Harris and Herzog do not support the view. While admitting that the microscopic appearance of the sections is compatible with the theory of Bovaird, Rolleston believes it to be more probable that the fibrous hyperplasia and the endothelial proliferation go on at the same time, and are due to the same cause. In some recorded cases where fibrosis and atrophy of the pulp and Malpighian bodies were the only changes noted, Rolleston thinks it possible that the change had progressed, as it may do in lymphadenoma, to fibrosis and the disappearance of the endothelial proliferation. Besides the splenic changes the bone-marrow may be red in some instances.

The above is the generally accepted pathological picture, but Barr² mentions as important changes in the semilunar ganglia and solar plexus of the abdomen and also in the ganglia of the neck. These changes consist in lymphoid infiltration of the stroma of the ganglia, fatty and pigmented degeneration of the ganglion cells, and a degeneration of the nerve fibres springing from these ganglia. Barr in his article reports three cases and advances an entirely new idea as to the

¹ Loc. cit.

² *Lancet*, August 23, 1902.

nature of the condition. His patients were males, aged forty-eight, forty-two, and thirty-eight years, and each had sustained a more or less serious injury to the abdomen some years previous to the occurrence of the disease. The blood pressure was low in all cases, due to vasomotor paresis of the splanchnic area. Two cases had ascites and one had pleural effusion.

Barr's view of Banti's disease is that it is probably due to a vasomotor paresis of the splanchnic area, either in whole or in part, and that this paresis arises from disease of the sympathetic visceral ganglia. As a consequence there is great engorgement of the abdominal viscera, especially of the spleen and liver, and increased hæmolysis with consequent oligochromæmia and oligocythæmia. The increased blood supply to those organs eventually leads to fibrosis and lessened function. The peritoneal effusion would seem to be due to increased vascularity rather than to portal obstruction. The paresis leads to retention of blood in the portal area with lessened supply to the rest of the body, fall in the general blood pressure with lessened work for the heart, impairment of nutrition, and muscular atrophy. The digestion is usually impaired, and there is likely to be an increase of toxins in the intestinal tract, with further aggravation of the mischief. The engorgement of the viscera and mucous membranes is a frequent cause of hemorrhage.

Osler states that the nature of the disease is unknown, but it is probably a chronic toxic rather than an infective process, but of the character and source of the poison we are ignorant. Harris and Herzog suggest that a chronic hæmolysis is caused by an enzyme manufactured by the endothelial cells. According to Rolleston, this does not explain the proliferation of these cells, nor does the blood resemble pernicious anæmia in which hæmolysis occurs.

Rolleston thinks it more likely to be a chronic infective or toxic process with headquarters in the spleen, and that the poisons there produced give rise in the first instance to endothelial hyperplasia and fibrosis of that organ, and later so inhibit the blood formation as to produce anæmia of the chlorotic type. The cause is unknown, but there is an analogy between the endothelial proliferation and the large-celled hyperplasia seen in some cases of tuberculous adenitis.

Grousdieff¹ mentions that in Banti's disease there is a "stage of urinary changes" which follows the "anæmic stage" in which the urobilin is found to be increased, and in Breuer's case² a similar increase of urobilin was noted. This would speak for the existence of hæmolysis.

The cases reported by various authors add little to the above-mentioned facts and theories. Cases like the second one of Rolleston, where

¹ *Vratch*, February 16-23, March 2, 1902.

² *Loc. cit.*

tuberculosis was thought to be causal, and the one reported by Hocke,¹ in which congenital syphilis was thought to be the underlying factor, illustrate some of the various conditions which can cause the same symptom-complex. This is further emphasized in the list of diseases given by Rolleston, from which splenic anæmia must be differentiated. Among these are leukæmia, pernicious anæmia, lymphadenoma, malaria, syphilis, tuberculosis, cirrhosis of the liver with splenic enlargement, gastric ulcer, thrombosis of the splenic vein, etc. The whole question was most thoroughly reviewed by Wentworth, whose conclusions were given in last year's consideration of this topic.

TREATMENT. This varies with the views of the authors as to the nature of the disease. In certain cases splenectomy is advised, though the mortality is high. The chief indication for this, according to Osler, is hemorrhage. The operation has been successful in several instances. Harris and Herzog² have collected nineteen cases in which recovery followed splenectomy. Murrel advises attention to the bowels with the use of external counter-irritants in order to aid collateral circulation or Talina's operation. Tansini³ reports a successful result in a case of Banti's disease in which both splenectomy and Talma's operation were done. Finally, Barr⁴ builds up the general condition and tries to raise the lowered blood pressure.

Clinical Examination of the Blood. BLOOD COUNTING. During the past year efforts have been made to diminish the amount of error always present in estimations as to the number of cells and to lessen the amount of time required for the examination. The Thoma-Zeiss instrument, however, still remains the one most frequently employed. Time-saving methods are especially desirable, as it must be conceded that extreme accuracy is not essential nor perhaps attainable. So many influences may alter the blood-count greatly, within short stretches of time, that too much reliance cannot be placed upon the significance of slight variations.

Einhorn and Laporte⁵ have devised a method whereby the enumeration of the blood-cells can be made from the dried smear. The smear is made with the usual precautions, and with the low power a field is selected in which the cells are neither too closely packed nor too widely separated. With objective D. D. and ocular 2 Zeiss the number of leucocytes in the field of the microscope is counted. As the number of red cells in so large a field is impossible to count, the No. 4 ocular

¹ Berliner klin. Wochenschrift, 1902, No. 16.

² Annals of Surgery, July, 1901.

³ Archiv f. klin. Chirurgie, vol. lxxvii., No. 4.

⁴ Fortschritte der Medicin, May 1, 1902.

⁵ Loc. cit.

fitted with a diaphragm, the square opening of which is 3 mm., divided into 4 small squares by fine platinum wire, is substituted. The field thus given is only about 1/20 of that used in counting the leucocytes. The number of red cells in this square field having been counted, ocular No. 2 is again placed in the microscope, and a new field counted in the same manner until 25 such fields have been enumerated. The area of the field with the D. D. objective and No. 2 ocular is 0.23 square mm., while that with the same objective and No. 4 ocular filled with diaphragm is 20.3 times smaller. By comparing counts made in the ordinary way with the counts made from dried specimens in 26 cases, the authors found that the number of red cells in 1 c.mm. was 500 times and the leucocytes 400 times greater than the number in 1 square mm. of the dried preparation. The reckoning for leucocytes is, therefore, as follows: Twenty-five fields equal approximately 6 square mm.; therefore, the total of the leucocytes is divided by 6 and then multiplied by 400. With the red cells the total number is divided by 6, then multiplied by 20.3 and by 500. The amount of error in their 26 cases averaged 4.8 per cent. for the red cells and 5.8 per cent. for the white cells. The Jenner stain is advised, and the authors claim the method is both rapid and easy. While it is desirable to have a rapid and fairly accurate method of counting, it seems doubtful to me if the method suggested by Einhorn and Laporte will serve the purpose. Considerable practice in preparing the blood-films will doubtless decrease the error, but the technique is too liable to hide errors except in those unusually skilled.

The enumeration of leucocytes is a matter of greater practical importance than the counting of the red corpuscles, and, fortunately, the methods are quite accurate. Here, again, expedition and facility are more necessary than extreme accuracy. Still, attempts are made from time to time to devise more accurate methods or to improve on those now in use.

Breuer¹ has devised a new form of counting chamber which differs in the ruling from the Thoma-Zeiss, the depth of the cell being the same, 1/10 mm. The field is divided into 9 squares, each 1 mm. by 1 mm. Three horizontal lines divide each large square into 4 quadrangles $\frac{1}{2}$ mm. in height and 1 mm. in width, each of which with the ordinary power occupies about 1/3 of the field of the microscope. In normal blood each quadrangle contains from 15 to 25 white cells, and 40 can be counted in each one easily. Should more than 40 be found in one quadrangle the blood should be diluted to a greater extent. Breuer usually dilutes the blood 1 : 10 with 1 per cent. acetic acid, to

¹ Berliner klin. Wochenschrift, 1902, No. 41.

which has been added gentian-violet (Türk's solution), and counts the leucocytes in 5 quadrangles. The sum of the white cells is then reckoned by multiplying by 20. For those who wish a chamber in which both red and white cells can be counted a specially ruled square millimetre space is provided in the centre of the chamber. Besides the estimation of the total number of leucocytes a differential count can easily be made from the blood prepared in the chamber, of the various forms of cells (except myelocytes), much more quickly and accurately than from the dried preparations. This and the preceding form of counting chamber are perhaps slightly more accurate than the Thoma-Zeiss, yet the advantages offered are scarcely enough to secure a very widespread use. It must be recalled that all methods of counting give only approximate results, and that an instrument in common use cannot be supplanted in favor of a new one unless the latter has advantages of a very positive kind. As long as the enumeration is only approximate, no new instrument will find favor unless its advantage is ease of operation.

STAINING. Considerable attention has been directed to the study of the behavior of the living blood-cell in the presence of different staining solutions. It will be recalled that it was formerly believed that living cells refuse all stains. This view is still quite generally, though not universally, accepted. Rosin and Bibergeil¹ publish some interesting investigations in this line, using the method advised by Ito.² The stain is first spread evenly on the cover-slip by allowing a drop to fall on one slip and then drawing over this the edge of another slip held at right angles to the first. With alcoholic stains the even distribution is readily obtained; watery solutions are less satisfactory. The stain is allowed to dry, and a drop of blood from the finger is permitted to fall on the slip and spread in exactly the manner described above. This must be done very quickly, with the greatest possible protection of the blood, and the smear is at once placed on a slide with a concavity (such as is used for examining hanging drops). The concavity contains a drop of water, and the slip is held in place by vaseline. The blood so obtained is living, and retains its vitality in unstained preparations for days. Marked amoeboid movements can be observed in the leucocytes even after forty-eight hours. Amoeboid movements were also seen in both forms of lymphocytes. They withhold statements in regard to the myelocytes, as the recognition of these cells is practically impossible in unstained specimens. The unstained blood-plaques showed a strongly refractile inner substance, which was thus differentiated from

¹ Deutsche med. Wochenschrift, 1902, Nos. 3 and 4.

² Allg. med. Centralzeitung, 1901, No. 101.

a less refractile outer substance. These observations as to the amœboid movements of the lymphocytes and the characteristics of the blood-plaques are in accord with the investigations of Deetjen, mentioned in *PROGRESSIVE MEDICINE* for June, 1902. Rosin and Bibergeil experimented with many stains, and give as the most important results of their work the following: 1. The demonstration of the chromophoric zones and the suddenly appearing staining of the leucocytes (at first they do not take the stain, but after "death" manifestations on the part of the cell the staining quickly follows), the existence of nucleoli in the lymphocytes, and the presence of basophilic granulations in the red cells of normal persons. All these were obtained from methylene-blue. 2. The taking up of the neutral red and the toluidin-blue in ball-like form. 3. The spasmodic amœboid movements of the leucocytes and the marked movements of the granulations before taking eosin and other acid stains. 4. The peculiar variability of the staining of the white corpuscles with eosin-methylene-blue mixture, and the differentiating stain of the blood-plaques with the same dye. 5. The red nuclear bodies in the blue nuclei of the lymphocytes with pyronin-methyl-green, which is a characteristic of this form of cells, the fine structure of the protoplasm, also the amphibolic stage of nuclear staining—the dying nucleus stains with pyronin, the dead nucleus with methyl-green. 6. The red chromatin basis exhibited in all blue nuclei by magenta-red methyl-green staining. The authors have worked only with normal blood. The value of such methods is rather of a scientific than of a practical kind, and the results have thus far been unsatisfactory. A consideration of this subject naturally suggests that of examination of the fresh blood—a matter that seems to me to have fallen into too much neglect. A careful study of older literature will show how much can be learned from such examinations of fresh blood. Practically all of the facts known regarding the morphology of blood-cells were recognized by Virchow and others before the staining era. Ehrlich's methods have served a double purpose in disclosing some facts not before recognized, and in developing a general interest in hæmatology, but they have also led to a neglect of older methods which are in some directions superior to the new.

I have already stated that the kind of stain is of less consequence than skill in the use of a particular one. Generally speaking, however, the triacid stain has not been satisfactory in my experience, though for certain purposes it is still the best. May and Grünwald¹ have also found the triacid stain unsatisfactory and variable, and have, therefore, experimented to produce a better mixture. They finally obtained a stain

¹ *Centralblatt f. innere Medicin*, 1902, vol. ii.

which gives constant results. It is prepared as follows: A litre of 1 per cent. of watery solution of yellow eosin is mixed with an equal quantity of 1 per cent. solution of methylene-blue (medicinal), and allowed to stand for several days, when it is filtered by the aid of a suction-pump. The filter is washed with cold distilled water until the filtrate becomes almost colorless. The residue, which peels off on drying, forms the new stain, which, under the oil immersion, is seen to be composed of brownish-red, needle-shaped crystals. This stain is soluble in water to a slight extent, and in ethyl-alcohol, ether, etc., but especially so in methyl-alcohol, which is the solvent preferred, as no fixation of the preparations is then necessary. The strength of the solution is not given, but it is presumably a saturated one. The stain thus prepared is kept in a vessel that can be closely covered and admits of repeated use. The smear is allowed to dry in air and is placed in the stain for two minutes (in poorly staining varieties of blood up to twenty-four hours), and then rinsed in distilled water to which has been added a few drops of the solution. In ordinary blood but five minutes elapses from the finger-prick to the completion of the staining. The erythrocytes are stained a light red, the nuclei of the leucocytes a moderately deep blue; nuclear bodies are differentiated; the α -granules are a deep red, the γ -granules a deep blue, recognizable as distinct oval bodies in the cell, in a manner seen in no other method. The nuclei of the "mast-zellen" in consequence stand out prominently in spite of their pale blue color. The ϵ -granules are shown beautifully, as very light red granules on an unstained background. The fine-blue granulation of the transitionals is shown less distinctly. The nuclei of the erythroblasts are as blue as in any method of methylene-blue staining, and the "anæmic degenerated" red cells are at once recognized by the bluish discoloration. Granular erythrocytes are recognized by the bluish dots. The blood-plaques are pale blue, and their structure distinctly recognizable. Plasmodia and bacteria are also well stained.

FIXATION OF BLOOD-FILMS. A great deal has been written about stains, and there is a great variety of mixtures to choose from. In my experience, however, too little attention is given to fixation of the films. The results obtained vary as greatly with skill in this as with the sort of stain employed. I have found that the fixation must be varied according to the stain used, and that a great deal of practice with a certain stain is required to make the fixation satisfactory. For some stains a high temperature is best, while others require a lower. The common teaching that a fixed temperature answers the purpose is far from true. A variation in temperature is also required when different structures of the cells are under consideration.

Jolly¹ calls attention to the fact that while fixation is necessary to the histochemical study of the cell, the ordinary methods do not fix the nucleus satisfactorily. The contour is retained, but after staining the nucleus is homogeneous. The cause of this lies in the drying of the smear previous to fixing, whereby the chromatin substance is dissolved in the juice of the nucleus. It is not possible to obtain proper fixation of both nucleus and remainder of the cell, so in order to study the former Jolly advises that the non-dried smear be placed in Fleming's solution for ten minutes. If the Heidenhain stain is employed both stain and mordant must be used longer than is usually done. The taking up by the nucleus of the methyl-green from the triacid stain is favored, while the staining of the granulations is not disturbed. My own experience with Fleming's solution and other osmic acid fixations has been less satisfactory than fixation by heat. This applies to the demonstration of nuclear structures as well as to the studies of the cytoplasm. Formalin has acted more happily than osmic acid. The latter, however, has given good results in the hands of Kornilovitch,² who uses the following method: A small camel's-hair brush is washed in strong alcohol to free the hair from fat, and then dipped in a solution composed of osmic acid, gm. 1 (15 gr.), sodium chloride, gm. 0.6 (9 gr.), and distilled water, 100 c.c. (25 3). This moistened brush is dipped in the exuding blood-drop, which spreads throughout the hair of the brush and is fixed by the osmic acid. With a light, even stroke the blood is spread by the brush on a clean, cool glass. The preparation thus fixed and spread at the same time is dried in air and then stained in the usual manner.

ALKALINITY OF THE BLOOD. A great deal of investigation has been devoted to the subject of the alkalinity of the blood, and numerous methods have been devised for estimating this. Unfortunately, it is impossible to give a definition of "alkalinity," and the various methods employed accomplish very different results. In one sort of investigation the free alkali alone is investigated; in another the total basic constituents of the blood; in a third the gas-combining property. Which one of these is most important cannot be determined, but whatever method or methods are employed should be uniform in the results obtained. Recently Dare³ has devised an instrument for the purpose of determining alkalinity. This instrument gives results similar to those obtained by other methods, and is new principally in the method of determining the end reaction. This is obtained by the use of a

¹ Archives de médecine expérimentale et d'anatomie pathologie, January 1, 1902.

² Vratsh, vol. xxii., No. 46.

³ Philadelphia Medical Journal, January 17, 1903.

spectroscope, as it is assumed that the absorption bands of oxyhæmoglobin disappear when the blood is neutralized with tartaric acid. The amount of hæmoglobin present has no effect on the point at which the absorption bands disappear. "In support of this assertion we have the simple experiment of adding solutions of known concentration of disodium phosphate in minute quantity, or of weak phosphoric acid solution to the blood mixture, and repeating the test; the point of neutralization will be found to vary with the degree of concentration of the acid or alkaline solution as a control experiment." In carrying out his method the neutralizing solution employed by Dare consists of Merck's chemically pure reagent, acid tartaric (crystals), 0.065 gm. (1 gr.) to 200 c.c. ($6\frac{1}{2}$ 5) of a mixture of alcohol, 1 part to 8 parts of distilled water. The alcohol was added to prevent fungous growth. In a footnote the author states that numerous experiments with various chemical indicators were tried in the hope that one would be found that would be convincing that the absorption bands of oxyhæmoglobin disappear at the point of neutralization. The attempts were unsuccessful, and he was compelled to rely on the experiment of increasing the alkalinity artificially and then testing. The apparatus and the method are simple, and the test is completed in a few minutes. In this connection the work of Brandenburg¹ is of interest. In a series of cases this author studied the alkali tension, the alkalinity, the amount of albumin, and the freezing-point of the blood. For determining the alkalinity he employed the Loewi-Zuntz method. He found that the alkalinity of the blood in the series of diseases in which it was found decreased, and even in those in which it has been found to be increased, is apparently dependent upon the actual concentration of the blood, though the concentration and the alkalinity do not run exactly parallel. The proportion between diffusible and total alkali is about 1:5—that is, about four-fifths of the alkali in the blood is in combination with albumin. The diffusible alkali was found much higher in anæmia, and in general the diffusible alkali increased as the albumin decreased, and *vice versa*. Adding alkali to the blood caused but little change in the combined alkali. The higher the alkalinity the lower the percentage of diffusible alkali. The freezing-point is lowered in proportion to the amount of diffusible alkali present in the blood, and it is probable that it is the diffusible alkali which chiefly reduces the freezing-point. The latter will, therefore, vary when other conditions than retention are present. Brandenburg considers that in order to appreciate the value of the figures found by determining the alkalinity of the blood, one should also, as a measure of its concentration, determine the

¹ Deutsche med. Wechenschrift, January 30, 1902.

nitrogen. By comparing these two conditions one may determine whether there has been any real increase in the amount of acids in the blood.

Leaving out of discussion the question of the alkali tension the results of Brandenburg's investigations as to the relation between the alkalinity of the blood and its albumin contents, if proven true, are of value. If the method of Dare proves to be accurate it and the apparatus of Jolles¹ used together would afford a fairly accurate and rapid method of determining the alkalinity and albumin contents of the blood respectively, and would thus greatly increase our knowledge as to the pathological conditions present in many diseases. The method of Jolles referred to depends upon the liberation of nitrogen from decomposition of the albumin. The results of the investigations are given as estimated by the Kehldahl, and by this method they are remarkably constant. In a series of cases in which this method was employed it was found that in diabetes, cirrhosis of the liver, catarrhal jaundice, anæmia, and leukæmia the albumin was reduced. In syphilis and Basedow's disease it was normal. In acute nephritis and in a case of influenza during fever it was increased.

IODOPHILIA. The occurrence of the glycogen reaction in the leucocytes under varying conditions and the method of obtaining this reaction were discussed in *PROGRESSIVE MEDICINE* of June, 1902. During the past year Kaminer² has published the results of his investigations on animals and men, which are of value in making clear the nature of this phenomenon. Careful study of the literature has shown that no relation exists between the intracellular reaction and glycosuria, while a distinct connection is shown between the reaction and many diseases associated with fever and leucocytosis. In such diseases three factors may be considered as being probable causes: 1. The fever. 2. The leucocytosis. 3. The presence of bacterial poison. Kaminer has previously shown that in sunstroke the reaction is not present, nor is it always found when leucocytosis exists. In animals this is readily shown by producing leucocytosis through various forms of injection, as spermin, and here, as in many instances of leucocytosis in man, iodophilia does not occur. There remains, then, only the bacterial poison to be considered, and the effect of various forms were tried on animals.

In all 130 rabbits and guinea-pigs were injected. From these experiments he determined with certainty that the glycogen reaction in the leucocytes is brought about by the poison of streptococci, staphylo-

¹ Münchener med. Wochenschrift, 1902, No. 38.

² Zeitschrift f. klin. Medicin, Band xlvii., Heft 5 and 6.

cocci, bacillus pyocyaneus, bacillus of diphtheria and of anthrax, Friedländer's bacillus, the pneumococcus, typhoid bacillus, and bacterium coli; by the toxin-like albumins, ricin and abrin, and by diphtheria toxoid. Chronic infection, as tuberculosis and glanders, can occasion the reaction, but in the animal experiments a marked divergence was observed. The reaction occurred very late, and, especially surprising, the reaction did not occur in rabbits with these diseases. No reaction was brought about with tetanus toxin, the toxin of chicken cholera, or the bacillus prodigiosus. Comparing the results of the animal experiments with investigations on man it was found that they corresponded so far as infection with pneumococci, streptococci, and staphylococci, and the bacterium coli (when it produces a septicæmia) is concerned, and all of these organisms giving a positive reaction. Negative results were obtained in tetanus infection in animals, as well as two cases in man that Kaminer examined. Tuberculosis gave a negative reaction in man until secondary infection took place. Of especial interest is the fact that the typhoid bacillus which caused the reaction in rabbits has failed to do so in practically all typhoid cases in man. While this may be of value practically in showing secondary infection in typhoid fever with staphylococci or streptococci, it is well to remember that it has been definitely shown that the typhoid bacillus can produce suppuration, and concerning the glycogen reaction in such cases we have no reports. It is probable that the reaction will be found in these cases without secondary infection. Diphtheria, positive in animals, is generally reported as negative in man, and Kaminer's own cases were also negative. Differences are liable to occur here, as secondary infection is common in this disease. Kaminer believes that whenever streptococci, staphylococci, or pneumococci occur in the blood, or when in cases of localized suppuration the toxin of the bacteria concerned enters the blood paths, as in abscesses following pneumonia, the reaction will be positive. He believes that the iodine-reacting leucocytes originate in the bone-marrow, and are an evidence of a pathological condition brought about by an abnormal stimulation, the iodine-reacting leucocyte being a degenerative phenomenon. This stimulation can be brought about by injections of turpentine, croton oil, etc., as well as bacterial toxins.

BLOOD-PLAQUES. The nature of blood-plaques still excites attention, and the discussion of the origin and nature of these bodies is by no means closed. The earlier (French) view that the plaques are the antecedents of red corpuscles has been quite generally abandoned, though some recent experiments have been published to revive this opinion. The preponderance of evidence goes to show that the plaques are derivatives of red corpuscles, and probably degenerative in nature.

The attempt to make them appear regenerative does not seem to me to be based on good grounds. Last year, in discussing Deetjen's article on this subject I expressed the opinion that the "amœboid" movements attributed by the above author to these bodies might easily be due to chemical action in his agar preparation. Nor did it seem to me that his evidence justified the assumption that the body described was a cell composed of protoplasm and a nucleus, for in studying the fragmentation of the red corpuscles the extrusion bodies there met with showed a differentiation of protoplasm similar to that mentioned by Deetjen as characteristic of the platelets.

Recently Wlassow and Sepp¹ have studied the plaques after the method of Deetjen, but came to conclusions differing from his. They call attention to the fact that previous to differentiation of the platelets a strongly refracting substance is evenly distributed throughout the platelets, and stained preparations showed the entire body to be more or less evenly stained with hæmatoxylin. Subsequently a change occurs in the platelet. The refracting substance (in other words, the substance stained with hæmatoxylin) contracts and draws itself into the centre, where it appears as a sharply defined, homogeneous inner body; simultaneously the outer paler substance swells, increases in area, and changes into a form with projecting points. Wlassow and Sepp are convinced that the appearance of a precipitated nucleus-like body and the simultaneously swelling protoplasm is to be attributed entirely to a separation of the platelet into two portions. This theory is based on the facts that the unchanged platelet is homogeneous when seen in streaming blood; secondly, that the plates, in rapidly fixed preparations, appear as large or small violet-colored elements; further, that the nuclear substance appears much smaller in its earlier as compared with its later stages; and, finally, that at the time that, according to Deetjen, the plaques are at the height of their activity, the nucleus-like structure is to be looked upon as a portion of a nucleus undergoing pyknosis or karyorrhexis. Wlassow and Sepp were unable to recognize the amœboid motions in the plaques described by Deetjen. The appearance of pointed projections in various parts of the periphery of the plaques is not characteristic of the movements of pseudopods. Besides this, the absence of independent continued movements and the fact that the platelet when once flat never regains its former round condition speaks against an active change of form. They found that when a preparation was exposed to the influence of a protoplasm poison, as chloroform, the same changes could be noted in the platelets, while the motion of the leucocytes was paralyzed.

¹ Centralblatt f. allg. Patholog. und Path. Anat.

Blood-plaques in Syphilis. Recently Losdorfer¹ has called attention to the enormous number of granules to be found in the blood of syphilitic subjects. Vörner² considers these granules to be blood-plates which he also found markedly increased in most syphilitics. While believing that the blood-plates are nearly always in excess in syphilitic subjects, their appearance does not depend upon any special stage of the syphilis, nor upon any special activity of the symptoms. Neither are they specific of syphilis, for they may be found in large numbers in other conditions. He believes that the excess of the plaques is due to the anæmia, and that when the anæmia is cured the increase can no longer be noted. Vörner, though apparently unfamiliar with the publication of Hans Hirschfeld,³ observed the same process of extrusion of the platelets from both the red and the white cells.

HÆMOPHILIA.

While nothing especially new has been published in reference to this disease, the cases reported by Türk⁴ as occurring through a series of generations in one family are of interest, because of the deviation from the typical form of heredity. The disease occurred in five generations of this family. Starting with the first generation the father was himself a bleeder, and transmitted the condition to two sons and one daughter. The two hæmophilic sons transmitted the disease directly to one male and six female descendants, so that in the third generation out of eleven members seven were bleeders, and of these six were females. In the fourth generation out of twenty members only five were hæmophilic, and all were males. In the fifth generation there was only one bleeder, a male, who since his fourteenth year has shown no hemorrhagic tendency. None of the people who married into this family had hæmophilia, nor had they an hæmophilic ancestry. The deviations from the usual laws of heredity in the family are :

1. The large number of females who were hæmophilic. Thus, in all there were seven females to ten males, while in the third generation the very unusual proportion of six females to one male was found. (The proportion given by Grandidier is one woman to thirteen men.)
2. The mode of transmission from the first to the third generation was exclusively direct, and this was the usual mode in the remaining

¹ Wiener klin. Wochenschrift, 1900.

² Deutsche med. Wochenschrift, December 11, 1902.

³ See PROGRESSIVE MEDICINE, June, 1902.

⁴ Wiener klin. Wochenschrift, 1902, No. 3.

generations. Thus, only once in the fourth and once in the fifth generations was the transmission indirect.

3. The indirect transmission also differed from the ordinary manner. In one case, a male, himself non-hæmophilic, transmitted the disease to his two male descendants, thus playing the rôle of the "conductor." In the second indirect transmission the non-hæmophilic mother transmitted the disease to her son in the ordinary way.

Türk calls attention to the interesting fact that not only was there a transmission of hæmophilia, but likewise a transmission of an arthritic and neuropathic diathesis in several members of the family. Thus a number of the hæmophilic members suffered at the same time from frequently recurring attacks of joint pain. (Joint symptoms must, however, be recognized as frequent in hæmophilia.) The patient under Türk's care had had two attacks, lasting for months, which clinically appeared to be true rheumatism. Especially noteworthy is the fact that simultaneously with these probably genuine rheumatic attacks there appeared a marked increase in the severity of the hemorrhagic diathesis. At this time there first occurred subcutaneous hemorrhages and bleeding from the mouth, which since that time assumed the chief rôle in the disease picture. In view of the relation in which rheumatism stands to transitory purpura, the influence in increasing the severity of a constitutional hemorrhagic diathesis is of interest. Neuropathic symptoms were noted many times in both the hæmophilic and non-hæmophilic members of the family. Türk's patient had typical hysterical attacks with contractures, hemianæsthesia, abasia, and what appeared to be hysterical fever. This circumstance is of significance, as a certain symmetry was noted in the hemorrhages. They either appeared simultaneously on symmetrical portions of the body, even where traumatic influences or artificial production could be excluded with all possible certainty, or there appeared first a one-sided hemorrhage which was soon followed by a similar hemorrhage on the other side of the body. This behavior forces one to think that the hemorrhage is connected with the nervous system, and that in this case the theory of von Recklinghausen, considering hæmophilia a neuropathy, is somewhat justified. Türk believes that possibly in this case vasoneurotic, perhaps also vasotrophic, disturbances may have been the cause of the hemorrhage.

Treatment. Nothing new is offered. The use of gelatin, calcium chloride, and suprarenal extract has already been mentioned. The reports as to the use of the latter have generally been favorable. The case of Kumeir,¹ however, may be mentioned as evidence that it,

¹ British Medical Journal, March 8, 1902.

too, may fail. The case was one of a wound of the tongue in a hæmophilic. The hemorrhage was profuse, and the wound was repeatedly packed with powdered suprarenal extract without effect on the bleeding, which was finally checked by the application of the cautery.

Wallis¹ reports the successful treatment of a hæmophilic, who bled greatly after the extraction of a tooth, with calcium chloride. The patient, a woman, was put on ten grains of the drug three times daily for a week, and her teeth then extracted. No marked bleeding occurred.

Ochsner² recommends albumin in the form of the whites of eggs in hæmophilia. When the whites of four to six eggs were given three times daily a very definite effect seemed to be exerted on the blood of such patients. This method of treatment, according to Ochsner, has never been published.

PURPURA.

While this condition is generally looked upon as secondary to some distinct disease the causal factor at times is difficult to discover. Such a case is reported by Gordon³ in a boy aged fourteen years. The illness began February 27, 1901, with pain and stiffness in the limbs and a rash on both legs. There was pain and tenderness without heat or swelling in the ankles, knees, wrists, and elbows, with a thickly-dotted purpuric rash on the extensor surfaces of both legs, the inner surface of the thighs, and the outer aspects of the elbows. The temperature and pulse were normal. The patient developed colic and hemorrhage from the bowels, which was severe. The purpura disappeared for two days, but was followed on March 3d by urticaria on the anterior aspect of each ankle. The joint pains shifted daily. Later on the abdominal pains returned, and nausea and vomiting developed. Various skin eruptions followed: erythema and purpura, urticaria and erythema exudativum, nodular thickening, papular eruptions, and later œdema of the left eyelid. For many weeks these various lesions succeeded each other, and the clinical picture defied description. Blood examinations were negative, and the urine normal, except for diminution during the first part of the attack. Fever appeared on the 22d, and on the 29th a loud systolic murmur was heard over the heart; cardiac dulness was not increased. In May, as the patient began to sit up, a mild attack of chorea occurred. Salicylates and other drugs were without effect, but the patient finally recovered. According to Gordon, his case of purpura differed from those described by Henoch in (1) its more continuous nature, there being no intervals of several days or weeks or

¹ British Medical Journal, March 8, 1902.

² Medical Record, November 1, 1902, p. 713.

³ Lancet, February 14, 1903.

even a year ; (2) in the prominence of skin eruptions other than purpura, and of what can only be called "flying œdema;" (3) in the cardiac complications; (4) in the chorea; and (5) in the diminished daily flow of urine.

A similarly atypical case is reported by Jacobson¹ under the title "Hemorrhagic Appendicitis as the First Manifestations of Purpura Hemorrhagica." This patient was a woman, aged thirty-seven years. Before she was first seen, February 21, 1901, she had been suffering from severe right-sided abdominal pain with some general abdominal disturbance. On the 22d there was some improvement, but on the day following the temperature was 104.5°. There was acute pain in the right side of the abdomen, with marked tenderness over the appendix. She complained of a painful point in the gall-bladder region, and another to the right of the appendix. There was resistance on the right side, but no marked rigidity. The abdomen was distended. The appendix was removed, and was found to be red in appearance, seemingly acutely inflamed; later microscopic examination showed interstitial hemorrhage, but no hemorrhage into the lumen. During the operation the bleeding was profuse. The operation was well borne by the patient, though she was hypersensitive, requiring codeine to relieve her. Two days after operation she was seized with pain in the left side of the chest, and the temperature, which had nearly reached the normal, rose to 102°. Two days later she developed a cough and raised a large quantity of bright red blood, and the same night she had a profuse nasal hemorrhage. The next day petechiæ appeared on the legs and abdomen, and the sites of the hypodermic injections showed subcutaneous bleeding. There were no further skin manifestations. The heart never showed signs of disease, nor were the joints implicated. There was no hemorrhage from the bowel or kidneys, nor did she ever vomit. She had a number of attacks of epistaxis, and the bronchial hemorrhage was persistent, and from March 3d to the 20th more or less blood-stained mucus was brought up almost daily. Except a stitch abscess there were no surgical complications. She was given suprarenal extract on March 20th, and no subsequent hemorrhage occurred. She was discharged on April 13th, and has since been perfectly well. The author does not think this case resembles those of Henoch, because of the age of the patient, the absence of hemorrhage from the bowels, and because of the non-recurrence.

Purpura Simplex. Carrière² reports the case of a fourteen-year-old boy in whom, after several days of rheumatic pains and some gastrointestinal disturbance, an extensive purpuric eruption appeared. Even

¹ Medical Record, Feb. 7, 1902.

² Archiv. de Méd. expér., etc., 1901.

the face showed the eruption, and there was marked gingivitis. Large hemorrhages were present on both knees and both malleoli. The temperature remained normal. Scurvy was excluded on the ground of lack of asthenia and of the usual etiological factors. The blood examination showed a distinct leucocytosis with marked increase of the eosinophiles. From the blood Carrière was able to cultivate in pure culture the bacillus described by Achalme and Thiroloix as occurring in acute articular rheumatism. The result offers a support to the theory that certain forms of purpura are of rheumatic nature.

A very unusual occurrence of purpura as a complication or symptom is mentioned by Weisz.¹ The patient was a man, aged twenty-four years, who had a second attack of gonorrhœa, during which fever and marked psychical disturbance appeared, together with numerous hemorrhagic macules on both extremities. Weisz attributes the eruption to emboli of the gonococci or to the effect of toxins produced by this organism. With the spontaneous cure of the gonorrhœa the eruption disappeared.

In diphtheria Buckley² mentions the occurrence of purpura in a child, aged ten years. On the eighth day petechia appeared along with colic, slight tenderness of the colon, severe and continuous vomiting, with hemorrhage from the bowels and rheumatic joint pains. The spleen was not enlarged, and the temperature scarcely elevated. The blood was negative, and the urine showed but a trace of albumin. During the course a cardiac dilatation was noted and an erythema with spots of urticaria appeared which were attributed to the antitoxin injection.

DIABETES.

Etiology. Despite the amount of work done comparatively little has been added to our knowledge of this disease. The very numerous conditions capable of producing glycosuria—the one diagnostic symptom—tend to interfere with animal investigation, owing to the difficulty of excluding these disturbing factors when investigating any one special cause. Recent observations have directed more and more attention to the pancreas as being the pathological seat of the disease, at least in the majority of the cases of true diabetes, yet the theories as to the manner in which the metabolic changes are brought about in pancreatic diabetes are by no means uniform. Hess³ has discussed various means of studying the nature of diabetes by animal experiments. The three chief forms of experimental diabetes are: 1. Bernard's piqûre, which acts by removing the glycogen supply in the liver, and is comparable

¹ Archiv f. Dermatologie u. Syphilis, Band lvii., Heft 1, 2.

² Lancet, July 20, 1901.

³ Münchener med. Wochenschrift, 1902, No. 35.

to the forms of human glycosuria which follow injuries to the nervous system, and probably some poisons act in the same way. 2. *Phloridzin diabetes*. This produces a primary poisoning of the kidneys with a consequent failure of the kidney filter to hold back the normal blood-sugar. This differs essentially from human diabetes in that the blood-sugar is diminished. (It must be remembered that the existence of a renal diabetes in man has been considered possible by Klemperer and others.) 3. *Pancreas diabetes*. The extirpation of the pancreas in animals produces symptoms and disturbances of metabolism which resemble closely those occurring in man, and many experiments have been made to determine the nature of the disease. Removal of the pancreas with the consequent loss of ferments causes a loss in the feces of ingested albumin up to 50 per cent. ; of carbohydrates up to 20 to 40 per cent. ; of emulsified fats, as milk, about 50 per cent., and of non-emulsified fats the loss is almost entire. This does not occur if a portion of the pancreas is left behind, even though this portion is not connected with the intestine. In the latter instance it is supposed that the ferments of the piece remaining are absorbed and then excreted through the intestines—a theory that is supported by the fact that injection of pancreas emulsion into the peritoneal cavity, or by feeding raw pancreas to the animal whose pancreas has been extirpated, absorption of food is increased. Besides these changes in absorption diabetes mellitus appears. Total removal produces this absolutely, but if a portion remains behind glycosuria does not occur. A remnant one-fourth the size of the original gland will prevent glycosuria entirely ; when one-eighth to one-twelfth of the gland is left there is a slight alimentary glycosuria. It is thus evident that the pancreas has two secretions—an outer digestive, and an inner, which has to do with the consumption of sugar in the organism. This double action is similar to that seen in other organs, as the liver, testicles, etc. The outer and inner secretions are independent of each other, as it has been shown that diabetes does not necessarily appear when the pancreas secretion is shut off from the intestine, while resorption may be normal or nearly so in severe diabetes. As to the changes that occur after pancreas extirpation, various theories have been advanced. Minkowski has suggested two possibilities : 1. Removal of the pancreas brings about the loss of some substance furnished by the pancreas whose absence produces diabetes. 2. After pancreas extirpation there is a “heaping up” of certain substances normally destroyed by the pancreas, whose presence causes diabetes. This latter theory predisposes an auto-intoxication after the loss of the pancreas, as mentioned by Senator,¹

¹ Deutsche Klinik, 1901.

and this supposition is supported by the appearance of coma, etc., as toxic symptoms. Finally, a combination of the two theories above mentioned may be supposed: that the pancreas furnishes a substance necessary to sugar metabolism, and further acts in neutralizing certain poisonous metabolic products. A similar action is seen in the thyroid and suprarenal glands, which, besides furnishing necessary substances to the brain and nervous system, act in neutralizing toxic materials. Lépine assumed that the pancreas produces a glycolytic ferment which passes into the blood and lymph, and is stored in the leucocytes until the destruction of these liberates the ferment and allows it to exert its action. He found that in normal blood obtained by venesection the sugar content diminished after a time, and believed that this diminution must be due to glycolysis, but this opinion is by no means generally accepted.

The second theory which attributes the diabetes to the heaping up of poisonous substances in the organism cannot be looked upon as positively proven, though certain positive results appear to speak for the assumption. Minkowski transfused the blood of a diabetic dog into a healthy one without being able to produce diabetes in the latter. This, though negative, does not speak against the theory, since the healthy dog possessed his pancreas, which might easily neutralize the excess of poison. The same objection holds for the experiment of Hédon, who injected the blood of a dog whose pancreas had been extirpated into a dog with slight diabetes (due to partial pancreas resection), and could produce no increase in the diabetes. Here, too, a functioning portion of pancreas tissue was present. Lépine¹ was able to produce a glycosuria lasting several days in a medium-sized guinea-pig by the injection of an alcoholic extract of 59 gm. blood of a depancreatized dog diluted in water. A similar quantity of extract from blood of a normal dog produced only a rapidly passing glycosuria. Lépine believes that these experiments are in favor of the idea that the pancreas acts—in part, at least—by destroying toxic diabetogenic substances. In the absence of the pancreas these substances increase, hence diabetes. This is one of the elements in certain cases of diabetes. Under the assumption that the pancreas produces a neutralizing material for the hypothetical poison, pancreas emulsion, water, and glycerin pancreas extract administered per os, subcutaneously, intravenously, and intraperitoneally have been used in diabetic dogs, hoping to bring about diminution in sugar excretion, but these attempts were failures. Hédon sought to find the neutralizing substance in the blood of the healthy animal rather than in the pancreas. He removed practically all the blood from a depan-

¹ Berliner klin. Wochenschrift, 1902, No. 16.

creatized dog and then injected the blood of a normal dog into the jugular vein. A diminution of the glycosuria was found only in one instance. De Dominicis injected portal blood of a healthy dog at the height of meat digestion into a depancreatized dog and produced a doubling of the sugar output. This Lépine considers to show a predominance of the "saccharifizierendes" ferment over the glycolytic ferment. Hédon thinks this does not mean an increased sugar formation in the organism, but on account of the poor supply of glycogen in the depancreatized animal there is a change of the "nahrsubstrate," introduced by transfusion, into sugar.

Hess proceeded from the assumption that the healthy organism must contain an especially large quantity of this supposed neutralizing product when an increased quantity of the poisonous product is introduced into the organism, and thus stimulates the pancreas to increased internal secretion. He, therefore, injected the blood-serum (50 to 150 c.c.) of a depancreatized dog into a normal animal, which, as already demonstrated by Minkowski, did not become diabetic, and, therefore, a prompt neutralization of the introduced poisonous product must be assumed. After nine to fourteen hours the serum of the healthy dog was injected into a diabetic animal, with the hope that a distinct diminution in the glycosuria or other marked change in the other diabetic symptoms might be produced and thus indirectly demonstrate the existence of a poison and antipoin. In some of these animals on the day of injection there was a distinct diminution of sugar, but this was of but short duration, and in other animals it failed entirely. The symptoms of intoxication—weakness, acetonuria, convulsion, and especially fatty degeneration of the heart, which were marked in all the dogs, and were to be looked upon as the causes of death—in no case were delayed by the serum injections. Hess, therefore, draws no conclusions.

Loewi¹ offers a somewhat different explanation of the production of glycosuria. The organism of the mammal possesses, as is well known, the ability to hold back the sugar circulating in the blood so long as the proportion of about 1 to 1000 is not exceeded. If an excess occurs (hyperglycæmia) glycosuria generally ensues, and, indeed, all glycosurias—even, according to Richter, that which often accompanies marked diuresis—are a consequence of hyperglycæmia, excepting phloridzin glycosuria. This alone occurs with a normal or subnormal quantity of sugar in the blood. The fact that normally no glycosuria exists is explained by Kolisch on the theory that the sugar circulates in a combination that protects it against excretion. When hyperglycæmia

¹ Archiv f. Experiment. Patholog. und Pharmacolog., 1902, Band xlviii., Heft 5, 6.

exists the combining body of the blood is not sufficient to unite with all the sugar and a portion remains free and is excreted. If the "non-binding" of the excess of sugar in hyperglycæmia is the cause of its appearance in the urine—if the sugar is in true solution—so must its excretion increase by diuresis, as does NaCl and urea. The result must be the same, no matter what the cause of the hyperglycæmia, whether pancreas extirpation or injection of sugar into the blood. In both cases—pancreas extirpation and by injection of sugar (glucose) into a vein—by the administration of a diuretic the amount of sugar appearing in the urine was more than doubled. From this he concludes as follows: That glycosuria after pancreas extirpation is a necessary consequence of the hyperglycæmia, because in this (condition) so much sugar circulates that the "bindekörper" is insufficient. In consequence free sugar circulates, and this must, like all free bodies in the blood, be excreted through the glomeruli. In dogs with phloridzin diabetes the most intense diuresis failed to produce an increase in the sugar output. This, he thinks, is proof that the normal blood-sugar exists in a "bound" condition and is thus protected from excretion.

Still different is the theory offered by Gilbert and Lereboullet,¹ according to whom there are two types of diabetes, both depending on disorder of the liver function—*diabète par anhépatie*, as a consequence of chronic insufficiency of the liver, and *diabète par hyperhépatie*, as a consequence of increased activity of the liver. In the first form the liver is continuously unable to hold back the sugar ingested or formed within the intestinal tract. In mild cases glycosuria is seen after the evening meal only, or in more advanced cases after every meal, and especially after that taken at midday. A still more marked case shows continuous sugar excretion with two maximal periods, each two to three hours after breakfast or dinner. The entire sugar output seldom amounts to more than 40 or 50 gm. (600–750 grs.); urea excretion is moderate; polyuria is not marked. Severe diabetic symptoms seldom appear. Slight changes in volume and consistency of the liver occur. The general condition is arthritic, and it usually occurs in old men, and is curable, as a rule. The second form shows marked glycosuria up to 600 gm. and more daily. Simultaneously there is often a noteworthy degree of azoturia. There are no signs of insufficiency of the liver, and this organ is often enlarged, though its consistency and form are not changed. This form develops much more rapidly than the preceding, and often ends in coma.

A similar difference of opinion is shown in the theories as to the source of the sugar excreted by the diabetic in excess of that taken in

¹ Gaz. hebdom. de Méd. et de Chir., 1901, No. 81.

the diet. Minkowski has shown that in a dog whose pancreas was removed and which had been made glycogen-free there was a fairly constant relation between the sugar excreted on a hunger diet or meat diet and the amount of nitrogen in the urine. This relation was found to average $2.8:1$ —i. e., 2.8 gm. (42 gr.) sugar appear in the urine simultaneously with 1 gm. (15 gr.) nitrogen, or the N. from 6.25 gm. (94 gr.) destroyed albumin. In many cases, however, this quotient has been so much higher that other possible sources of sugar have been sought for. Hesse¹ reports the results of his studies of metabolism in two cases. In one of these the quotient equalled $9.24:1$; in the other $11.64:1$. The greatest excretion of sugar occurred during the period when the amount of albumin intake was the highest. This behavior speaks against the assumption that the sugar is formed from fat; besides, the amount of fat administered was too small to account for the excess in sugar. In one of his cases the quotient was at one period 7.34. The amount of fat taken in was too small to account for more than a few grammes of sugar, and the patient himself too emaciated to offer any such source. If, now, the excreted N. represented every albumin molecule entering into metabolism this quotient must indicate that 7.34 gm. (110 gr.) sugar arose from the destruction of 6.25 gm. (94 gr.) albumin, which is impossible. Hessé, therefore, believes it possible that more albumin molecules are involved in the metabolism than are shown by the urinary N. These, however, lose only the portions necessary for sugar synthesis and the remaining portion, rich in nitrogen, is retained. The amount of urinary N., therefore, allows of no conclusion as to the albumin metabolism; the reckoning of the amount of albumin from which the "eiweisszucker" originates, on the basis of the quotient D. : N. is valueless, and should no longer be considered.

Rumpf,² while admitting the origin of some of the sugar from albumin, explains the high values of the quotient D. : N. on the ground of the formation of sugar from fat. He thinks it probable that the body may take a portion of the necessary sugar for its maintenance from the fats or the glycerin of the fat. This sugar formation from fat occurs only in cases of great necessity, and against this assumed necessity the known fact that sugar excretion is not increased by an abundant administration of fat offers no essential rebuttal.

Creiner³ has investigated the action of glycerin in sugar production. A dog was starved for two days and then given 2 gm. phloridzin three times daily until the sugar quotient (D. : N.) reached a constant

¹ Zeitschrift f. klin. Med., Band xlv., Heft 3, 4.

² Ibid.

³ Münchener med. Wochenschrift, 1902, No. 22.

worth, which was on the second day. Beginning on the third day the animal was given 30 c.c. (3j) glycerin every eight hours for five and one-third days. In the beginning only glycerin was given, but later meat and fat were also administered. The average daily increase of sugar amounted to about 50 gm. (750 gr.). During the last eight hours of the glycerin administration the sugar quotient was still greater than 8. With the omission of the glycerin the quotient fell to approximately its former level. From this Creiner concludes that glycerin is a true builder of dextrose and glycogen, and that the administered neutral fat is, with its glycogen component, likewise to be considered as a dextrose builder.

Kolisch¹ believes that the formation of sugar from fat, or by splitting off from the albumin molecule, is improbable, and he looks on the high sugar quotient as being due to N. retention.

Acetone, Diacetic and Oxybutyric Acids. Concerning the formation of these acids there seems to be more uniformity of opinion. Both Hesse² and Rumpf³ agree that these substances are to be looked upon as being derived from fat. Rumpf mentions as especially interesting the sudden appearance of diacetic acid on the withdrawal of all carbohydrates. In many instances this may disappear, but in certain severe cases, when once diacetic acid has shown itself in the urine, it remains as a constant symptom.

Diabetic Coma. There has been a pretty general tendency in the last few years to look upon the coma in diabetes as an evidence of acid intoxication, the acid chiefly concerned to be oxybutyric. The work of Magnus-Levy, Herter, and Wright and Joslin carried out along these lines and coming to similar results regarding the oxybutyric acid, was fully discussed last year. Another view of this condition is given by Rumpf,⁴ which is worthy of consideration. While admitting the frequency with which oxybutyric acid is found in the urine of diabetics, he insists that the amount of the excretion does not run parallel to the appearance of coma. Thus, in his case just before death in coma the urine showed a levorotation of 0.2° and 0.3°, while in another patient, who was discharged improved, a levorotation of 0.4° and 0.5° was frequently met with, and a third case, also discharged improved, showed levorotation of 0.6°. Rumpf mentions the cases of Neunyn, which excreted more than 100 gm. (1500 gr.) daily of oxybutyric acid, and of von Noorden, which repeatedly showed 2 per cent. of oxybutyric acid throughout a period of two and a half years. Similarly, the ammonia excretion in no way parallels the appearance of the coma. Thus, in one of Rumpf's cases discharged as improved the ammonia was more than 5

¹ Wiener med. Wochenschrift, 1902, Nos. 20-22.

² Loc. cit.

³ Loc. cit.

⁴ Loc. cit.

gm. (75 gr.), while another patient shortly before death showed but 3 to 4 gm. (45–60 gr.). Without doubt there is an increased excretion of NH_3 and acid in severe forms of diabetes, but the amount of these is not parallel with the severity of the case or with the appearance of the coma. Nor does Rumpf deny that the acid intoxication plays a rôle in the development of coma; but since coma may appear when only a slight acidosis is present, and may not occur for a long time even when acidosis is marked, it is possible that other factors contribute in calling forth the condition. The discovery of the so-called coma casts was of interest, as the frequency of albuminuria and granular casts had led to the belief that diabetic coma was only a form of uræmia. Rumpf is convinced of the constancy of these casts in coma. In his patient, on the second day of strict sugar-free diet, there appeared typical coma casts in the urine, which had previously been free from albumin and casts. At the same time the patient showed unrest, weakness, cardiac palpitation, and rapid pulse. This disappeared on the fourth day, when a litre of milk was added to the diet. A month later, during which time the urine contained no casts or albumin, the experiment was repeated with similar results. In his patient, on the thirteenth day of a strict diet, coma casts appeared with symptoms of coma, which disappeared on the daily administration of one-half litre of milk and 50 gm. (750 gr.) of bread. Rumpf believes the coma casts to be an accompaniment of the coma, but not the cause. In another case the metabolism was studied up to the time of the appearance of the coma. This patient was in a condition of complete nitrogen equilibrium, and received sufficient nutrition to more than cover his needs, after reckoning out the excreted sugar. The stools were infrequent and contained only a little N. and no fat, and only traces of fat acids. In spite of this the patient lost 6.5 kilos (16 lbs.) in fourteen days, and this loss preceded the onset of the coma. The marked loss cannot be explained by the excretion of oxybutyric acid, acetone, diacetic acid, or the small amount of volatile fatty acids. A more deeply extending process must be active that presumably plays a rôle throughout the course of diabetes, but now first manifests itself plainly. According to Rumpf, this process lies in the loss of water. Not only is the water content of the blood diminished in cases of coma, but especially that of the liver, kidneys, muscles, etc. In two cases treated by transfusion the water content of the blood was normal, but that of the organs was still below par. In both cases the appearance of the coma casts and the coma symptoms were preceded by a marked increase in the urine excretion. What circumstances bring about this diminution in the water content of the tissues remain unknown. It is questionable whether through water administration it can be permanently equalized. That temporary equalization is possible appears to

be shown by the occasional cases of coma diabeticum relieved by transfusion.

The Association of Graves' Disease with Glycosuria and Diabetes Mellitus. Heinrich Stern¹ discusses glycosuria as a concomitant of Graves' disease. It may occur (1) as alimentary glycosuria; (2) as spontaneous glycosuria; (3) as diabetic glycosuria. The frequency with which the alimentary type, *e saccharo*, occurs has been variously estimated by different authors. Chvostek found it in 69 per cent. of his cases of Graves' disease, and considers it as a rather constant symptom. Kraus and Ludwig found it in 4 out of 6 cases. Strauss found it less frequently in 3 out of 19; Naunyn could only produce it once in his numerous cases; Stern produced it but once in 8 cases. In Stern's experience the assimilative power for glucose is not more frequently diminished than in many other conditions of gastro-intestinal disturbances. Goldschmidt found that alimentary glycosuria was more frequent in Graves' disease than in the normal, but no more frequent than in traumatic neuroses.

Spontaneous glycosuria has been frequently reported as a transitory symptom, but Stern believes that many of these cases were true diabetic glycosuria. Stern found 1 case of spontaneous transitory glycosuria out of 10 cases of Graves' disease. This patient was a negress who had pulmonary tuberculosis as well as Graves' disease, and sugar was found in the first two specimens of urine passed after her admission. Though the diet remained a mixed one, repeated subsequent examinations revealed no glucose.

The association of Graves' disease with true diabetes mellitus seems to occur more frequently than that with spontaneous glycosuria. This association may occur in three ways: 1. The Graves' disease may appear during the course of diabetes mellitus. 2. It may develop contemporaneously. 3. The diabetic phenomena may be subsequent to the Graves' disease. Cases of the first variety have been reported by Hartmann, Schmidt, and Grube; cases of the second variety are reported by O'Neill, Bettmann, Grawitz, and others; cases of the third variety are mentioned by Wilks, Lauder Brunton, and many others, and to this variety belongs the case presented by Stern in his present paper.

The patient, a woman with a negative family history, in 1898, when fifty-four years old, developed Graves' disease subsequent to a severe shock. The patient lost in weight, and albumin but no sugar was found in the urine. Under persistent thyroid medication the goitre and exophthalmos disappeared and weight was regained. Some tachycardia

¹ Journal of the American Medical Association, October 18, 1902.

persisted. In October, 1901, the goitre recurred, and there appeared symptoms of diabetes, as polydipsia, polyphagia, polyuria, and glycosuria. When admitted by Stern she was cachectic, pale, weak, and easily excited. The thyroid was enlarged in both lobes, the right to a greater extent. Pulsation seen and felt; murmur not noted. Exophthalmos was marked, with the signs of Graefe and Moebius present. Cardiac action was rapid, 118 per minute, forcible impulse with distinct systolic murmurs over base and apex and in the cervical vessels. Lungs apparently were normal; stomach was slightly dilated; liver was palpable and tender; the spleen was slightly enlarged. The temperature was 37.2° C. (99° F.) by rectum. The frequent examinations of the urine in the two months she was under observation showed the twenty-four-hour output to vary between 3200 and 7500 c.c. (106 and 212 $\frac{3}{4}$); specific gravity, between 1008 and 1016; glucose, between 0.2 per cent. and 1.15 per cent.; glucose in grammes, between 4.88 and 60.38. Acetone and diacetic acid were found at each examination. The diet was mixed, with a predominance of proteids and milk, 750 to 1500 c.c. daily. Medication consisted of bicarbonate of soda, 20 to 30 gm. (300 to 450 gr.) daily, which was discontinued after four or five days; thyroid powder, 0.12 (gr. $\frac{1}{8}$); acid arsenosum, 0.001 (gr. $\frac{1}{84}$); adonidin, 0.005 (gr. $\frac{1}{20}$).

Blood Examination: Alkalescence, 266.5 milligrammes NaHO in 100 c.c. blood; specific gravity, 1039.5; hæmoglobin, 44 per cent.; red cells, 2,240,000; white cells, 18,000. Bremer's reaction was negative. The leucocytosis was found from cover-glass preparations to involve chiefly the lymphocytes (small) and polynuclear neutrophiles. The patient died without coma.

A rigid proteid-fat diet, which is imperative for a time at least for the rational treatment of diabetes, was not well borne in most of his cases of exophthalmic goitre. While theoretically this diet is indicated in hyperthyroidism in order to save the body albumin, it does not prevent albumin disintegration to any extent in that affection. The best results are obtained by a mixed diet. The thyroid medication at first increased the glucose output, but after four days there was a diminution of sugar, which lasted only a short time. He never found albumin in this case.

The association of glycosuria and Graves' disease occurs more frequently in the female. Of 24 cases of Graves' disease and diabetes 22 were in females. The average age of occurrence was about thirty-nine, at or near the menstrual cessation. The prognosis appears to be unfavorable, as 10 cases of the 24 reported died while under observation.

There seems little doubt that Graves' disease is due to perverted action of the thyroid or parathyroids or both. That hypersecretion is not productive of the glycosuria is evident from the infrequency of

the combination. That diminished activity is not causal is shown by the failure of Minkowski to produce diabetes by removal of the thyroid.

The association of hyperthyroidism or dysthyroidism with diabetes is explainable only by the perverted action of a fermentative substance usually generated in minute quantities by the thyroid or parathyroid. Pathological action of the glands need not necessarily comprise perverted activity of the special ferment; hence the relative frequency of Graves' disease and the great rarity of its association with coincident or subsequently appearing diabetes.

This special ferment has not been found, but it probably exerts a plasmolytic action.

The Pancreas and Diabetes. The pathological changes occurring in the pancreas and especially in the islands of Langerhans in patients dead of diabetes were fully discussed in last year's review, in which was given all of the cases reported up to that time. During the past year but few publications on this subject have appeared, the most important being that of Weichselbaum and Stangl,¹ who reported a second series of seventeen cases. The pathological changes noted were of three varieties: 1. Simple atrophy. 2. A form of change which they call vacuolization and "verfluessigung" (hydropic degeneration). 3. An increase in the connective tissue partly within and partly without the islands of Langerhans. Besides, hemorrhages and calcifications were noted. The authors think that the findings in their own and other published cases point strongly to the existence of a close relation between diabetes and disease of the islands.

Diabetes Insipidus Transformed into Diabetes Mellitus. Kuhn² reports a case of this very rare condition which he believes is the fourth one recorded, though numerous cases in which diabetes mellitus was present and later passed into diabetes insipidus have been published. Two of these cases are reported from the clinic of Frerichs and the third was reported by Senator in 1897.

Senator's case was that of a woman, aged forty-seven years, who was said to have suffered from great thirst since her youth, and to have passed a correspondingly large quantity of urine. When first seen the twenty-four-hour quantity of urine amounted to 12 to 13 litres (408 to 452 $\bar{3}$), with a specific gravity of 1001 to 1003, and contained no albumin. Three years later sugar appeared for the first time. The urine remained very pale, with low specific gravity, and was voided in quantities of ten to twelve litres daily. After the appearance of the sugar the patient

¹ Wiener klin. Wochenschrift, 1902, No. 38.

² Münchener med. Wochenschrift, January 21, 1902.

failed visibly, though no abnormalities were found in the various organs, and in spite of the use of various remedies against diabetes she died.

The case of Kuhn occurred in a woman, aged fifty-eight years, who was in the hospital from April to July, 1899, for pneumonia, following which she had an empyema for which the eighth rib was resected. During this period the urine was normal in amount and composition. In July, 1900, she was again admitted for mammary cancer, and a radical operation done. In January, 1901, she reported that she had to drink large quantities of water, and that the excretion of urine was proportionally increased. She claimed that she was suddenly seized with intense thirst one afternoon while calling on her sister. On account of this condition she remained in the hospital from February 28th to March 27th, during which time the daily output of urine varied between 5 and 7 litres (170 to 238 ℥), with a specific gravity of 1002 to 1004. As at no time could sugar be demonstrated, the diagnosis of diabetes insipidus was made. As her condition at home did not improve she was again admitted on April 16, 1901. At this time she was emaciated, pale, weak; no abnormalities of organs except marked dryness of the tongue. Urine was light in color, clear, specific gravity 1006, daily quantity 8900 c.c. (280 ℥). Bowels constipated; no sugar in urine even by the spectroscope, and no albumin. Until May 3d there was slight increase of temperature. Urine secretion averaged about 7000 c.c. (216 ℥), but once reached 10,200 c.c. (316 ℥). The intake of fluid was, as a rule, somewhat behind the output of urine. Repeated examinations failed to reveal sugar or albumin. From May 2d to May 20th there was fever with marked remissions, the highest point being 39° C. (102.5° F.). During this period there was a diminution in the intake and output of fluid, the former being from 4000 to 6000 c.c. (125 to 187 ℥), and the latter from 5000 to 6000 c.c. (156 to 187 ℥). This effect of fever has already been observed by Strubell, who has attempted to diminish the thirst by causing fever by injection of 0.1 gr. deutero-albumose under the skin.

Subcutaneous injections of normal saline and the administration of opium was without avail. With the fall of temperature on May 20th there was a diminution in amount of urine to 5400 c.c. (168 ℥) and increase of specific gravity to 1011, and sugar to the amount of 1.8 per cent. appeared. Acetone and diacetic acid were not found. The patient now rapidly failed, and died on May 28th. Sugar was present up to the time of death, varying between 1.5 and 1.8 per cent. Autopsy showed no brain lesion; bronchial and mediastinal glands showed some metastasis. Spleen of usual size, pale and soft. Pancreas rather thin and atrophic. The capsules of both kidneys stripped with difficulty, and numerous metastatic nodes were present. The under portion of

the right adrenal contained a nodule the size of a cherry. In the region of the solar plexus there were various enlarged and metastatically diseased glands.

Diagnosis: Carcinoma cicatricis mammæ sinistræ, glandularum lymphaticarum multiplex, glandulæ suprarenalis.

The author thinks this case shows a near relationship between the two processes. The failure of brain involvement leaves this out of discussion. Changes in the coeliac plexus, which supplies vasomotor nerves to both kidney and liver, have been observed in diabetes insipidus by Dickinson and Schapiro and in diabetes mellitus by Lustig. Against these findings there is only the negative result of Peiper, who, after extirpation of the coeliac plexus and following degeneration of the splanchnic nerve, was unable to produce diabetes. Kuhn believes that in his case the assumption is permitted that the diseased lymph-glands in the neighborhood of the solar plexus, through pressure on the same, had produced degeneration manifestations with action on the metabolism. (No microscopic examination is reported.) The author has been unable to find any mention of changes in the adrenals occurring in diabetes similar to those found in his case.

The anatomically diagnosed atrophy of the pancreas could be looked upon as a cause of the diabetes mellitus. For the first existing diabetes insipidus it proves nothing, since up to the present diabetes insipidus alone and passing into diabetes mellitus has not been observed after experimental extirpation of the pancreas.

He believes that his case teaches that a connection exists between diabetes mellitus and diabetes insipidus.

D'Amato¹ has reported two cases in which a similar transformation took place.

Pancreatic Lesions—Diabetes and Icterus. Teleky² reports two instances in which the above combination occurred. Both patients were men, aged fifty and fifty-one years. In both the first symptom was mellituria, which did not entirely disappear on a strict antidiabetic diet. After a few weeks icterus appeared in both instances, and with the onset of this, sugar was no longer found in the urine in spite of the fact that the diet contained much carbohydrate. Examination of the stools revealed a failure of fat absorption. Both cases came to autopsy. In one case the pancreas was distinctly smaller, and the portion of the ductus choledochus contained within it was greatly narrowed while above it was dilated. Microscopic examination showed marked diminution in the amount of gland tissue with increase in the fibrous tissue,

¹ *Riforma medica*, May 13, 1902.

² *Wiener klin. Wochenschrift*, 1902, No. 29.

and the contraction of the latter was looked upon as the cause of the narrowing of the duct. The other organs in the body were normal. In the second case a cholecystenterostomy was done, but the patient died shortly after. The pancreas in this case showed nodules composed of acini circumscribed by dense connective tissue. The connective tissue in the same portions was infiltrated with fat. The other organs were normal. In such instances Teleky thinks operation would offer the best means of treatment. The uncertainty of diagnosis in cases of disease of the head of the pancreas renders operative procedures of doubtful utility, while the difficulties of such operations themselves constitute a barrier to success.

Diabetes and Pregnancy. The occurrence of true diabetes in pregnancy is very unusual, and reports on the subject are of great interest. Herman¹ details an instance and discusses the frequency of the combination. His patient was a woman, aged thirty years, in whom the condition was first diagnosed during pregnancy. The foetus was decomposed and born prematurely, the mother dying two and a half weeks later. The rarity of the association of diabetes and pregnancy is due in a measure to the fact that the disease is most common between the fortieth and sixtieth years, and two-thirds of all cases in women begin only after the menopause. Besides, in young women the onset of diabetes leads, as a rule, to suppression of menstruation, and occasionally to atrophy of the uterus. Here, as in all young people, diabetes is of grave import. In those instances in which diabetes appears each time during pregnancy and disappears during the puerperium the prognosis is more favorable than in cases where a diabetic woman becomes pregnant. In the latter case premature termination of pregnancy by death of the foetus has occurred in two-thirds of the published observations. Hydramnios has been frequently noted. In some instances coma and collapse occurred after delivery.

Suprarenal Diabetes. The various theories and experiments concerning the production of glycosuria by injections of the suprarenal gland and its derivatives were thoroughly discussed last year. But little that is new has been added, and this method of inducing glycosuria adds only another to the already long list of substances possessing this action. Blum² has reported some further investigations. He was able to obtain glycosuria in animals by the injection of suprarenal extract, "suprarenin" (Abel) or "adrenalin" (Takamine) in small amounts. This occurrence of glycosuria was not dependent upon the diet, as Blum obtained it in dogs living entirely on meat. The author thinks

¹ Edinburgh Medical Journal, February, 1902.

² Archiv f. d. ges. Physiologie, 1902, Band xc.

it improbable that the adrenals are in any way concerned in the metabolism of the carbohydrates, and attributes the glycosuria to injury done to the liver by the circulating substance, which affects chiefly the glycogen storehouse of this organ. Thus he found that the sugar content of the blood was increased after adrenal injection. Blum's observations on the significance of fat in diabetes are interesting. Thus, in normal animals with healthy cells the sugar excretion after adrenal injection gradually diminished parallel to the loss of glycogen in the liver. After the administration of olive oil the sugar content of the urine again rose—a fact that must be looked upon as showing the formation of sugar from fat.

Herter¹ has reported numerous experiments which were made with a view to determining the cause of the diabetes produced by adrenalin injection. He believes that the action is similar to that of many other reducing substances, and consists essentially in an interference with cell oxidation. The blood pressure-raising action of the substance has no effect on the sugar output, and when adrenalin is painted on the pancreas sugar appears in the urine, though the evidences of increased pressure in the pancreas, as blanching, do not occur. In fact, the pancreas assumes a deeper color, which would indicate congestion. Microscopic examinations of the pancreas from dogs dead of adrenalin injections revealed no change in the islands of Langerhans.

In this connection the publication of Barba² concerning the effect of injections of suprarenal extract on man is of interest. This author did not find a glycosuria as a result of the injection of even considerable doses in the several patients on whom it was tried. This finding is exactly contrary to my own experience with adrenalin, which acts in practically the same way as the adrenal extract. Even small amounts injected subcutaneously when not greatly diluted produced a glycosuria, while larger quantities given intravenously (well diluted) caused no appearance of sugar in the urine. The subject has been thoroughly tested on animals, but on man the reports are too few and too various to admit of a decision as to its action.

NOTE.—There must be some great difference in the action of adrenalin depending on the site of application. Applied to the mucous membrane of the eye or nose it causes marked constriction that may even be rather disagreeable subjectively. As we have seen, in the pancreas a congestion is produced (Herter), while taken internally on an empty stomach (one of my associates in experimental work took f3ij undiluted) no sensations are noted.

¹ Medical News, May 10, 1902.

² Riforma medica, October 22, 1902.

Treatment. This is as unsatisfactory in many instances as are the various explanations concerning the cause and mechanism of the disease. What seems to be certain is that we have to do with some disturbance of the carbohydrate metabolism, and consequently the regulation of the diet with a view to the avoidance of carbohydrates as much as possible constitutes the fundamental basis of all treatment.

Eichhorst¹ details his method of treatment. Drugs are condemned as being useless and tending to divert attention from the main point—the diet. Even in cases where syphilis was supposed to be the cause of the diabetes no results were obtained from mercury and potassium iodide. As to the water cures (Carlsbad, Neunahr) Eichhorst states, “if the patient would use the same care at home in his choice of diet the same results would be obtained.” This form of treatment is for those who will not follow out directions at home. Hospital treatment is advised for those whose will-power is too weak to enable them to follow directions, or who cannot afford the expensive diet. The basis of his treatment lies in the diminution of sugar and carbohydrates in the diet, which increase the sugar output and the thirst while diminishing the strength. For sweetening he advises saccharine in preference to “dulcin,” as requiring a less amount, and being not so liable to produce unpleasant effects on the organs of digestion. The carbohydrates should be withdrawn gradually in the great majority of cases in order to avoid gastro-intestinal disturbances and the signs of auto-intoxication. This is also emphasized by Rumpf,² who insists that a total withdrawal is dangerous. Care must be taken that the diet contains sufficient calories. A normal man needs 2500 to 3000 and the diabetic often more, in order to cover the loss of the excreted sugar, 1 gm. (15 gr.) of sugar represents approximately four calories, and the amount lost in sugar daily can be estimated from the urine. When the patient stands fat well it should be freely given in the form of butter, bacon, cream, fat meats, fat ham, cheese, fresh and smoked salmon, etc. When bread is allowed he favors Graham bread, as it is well borne, palatable, and satisfies more quickly. Alcohol is avoided. Milk may be advised in spite of its containing sugar, though Eichhorst has never seen results from the so-called milk cure. Tea and coffee should be well diluted, and cocoa must be tried first to see if it increases the sugar. Daily weighing of the patient is of great importance. The patient should be well clothed, avoid bad weather, and should exercise in the open air.

As a certain amount of carbohydrates is necessary to the maintenance of the individual, the selection of the form in which these shall be

¹ *Therapeutische Monatshefte*, September, 1902.

² *Loc. cit.*

administered to diabetics is of importance. Recently Mossé,¹ in a series of articles, reports his results obtained by the use of potatoes. In all the author experimented on 22 cases, of which 21 showed distinct improvement. As a rule, 2½ gm. (37.5 gr.) potatoes may be considered as equivalent to 1 gm. (15 gr.) bread. Both in the mild and severe cases there was an improvement both as to sugar reduction and as to the general condition. The thirst became less and the strength increased. A return to the bread diet interrupted the improvement, but even when the patient returned to his former amount of bread the sugar output was less than before the potato diet had been given. The beneficial action is attributed by Mossé chiefly to the potash salts contained, though the "mangan" present probably plays a part. Mossé uses baked potatoes, and gives as much as 1.5 kilos (4.25 lbs.) daily.

Treatment with organic extracts has been tried during recent years with some reported good results. Gilbert and Lereboullet² consider that by the administration of extracts from the liver and pancreas we have both a means of cure and of diagnosis. Thus in cases of diabetes due to liver insufficiency extract of liver is curative, while extract of pancreas will increase the symptoms. On the other hand, where hyperactivity of the liver is present the use of liver extract makes the condition more grave, and pancreas extract is indicated. Of the liver extract, doses of 12 gm. (180 gr.)—representing 100 gm. (1500 gr.) of fresh liver—are given. The pancreas extract is given in capsules containing 25 c.c. (6.5 ʒ), which escape stomach digestion and thus act only in the intestine, or per rectum in the form of suppositories, each containing 0.5 to 1 gm. (7½ to 15 gr.), one hour before meals. The pancreas extract has an inhibiting action on the liver. Dietary measures and milk treatment may be employed in both cases, but are most effective in lessened liver action where liver massage is also an aid. Wegele³ reports an apparent cure in a diabetic following the administration of "pancreon" in 0.5 gm. (7.5 gr.) tablets, three to four times daily. The sugar disappeared from the urine in three days, and the patient gained ten pounds in six weeks. Six months later glycosuria was still absent, but alimentary glycosuria could be demonstrated. Omission of the pancreon had a bad effect on intestinal digestion, bringing about steatorrhœa.

Concerning drugs may be mentioned the report of Mayer,⁴ who aborted four attacks of coma in a patient by the administration of urotropin, which he gave in daily doses of 20 to 60 grains until nocturnal diuresis compelled withdrawal. In the fifth attack the patient was

¹ *Revue de Méd.*, 1902.

² *Fortschritte der Med.*, 1902, No. 10.

³ *Loc. cit.*

⁴ *Medical Record*, March 8, 1902.

restored to consciousness, but died from asthenia. The urotropin in the presence of an acid breaks up into formaldehyde and ammonia. This change occurs in the kidneys. The ammonia is rapidly absorbed by the kidney veins while the formaldehyde is excreted.

It is found of interest to note that Rumpf¹ states that in the treatment of diabetic coma he has had no results from the use of soda bicarbonate, which is directly contrary to the findings of Magnus-Levy (see last year's *PROGRESSIVE MEDICINE*).

Finally, Faulds² reports the use of eucalyptus prepared in the following way: One tablespoonful of the dried leaves of the eucalyptus globulus is placed in a teapot and covered with six ounces of water and allowed to infuse for half an hour. To this is added a little saccharine, and the entire amount taken at one dose, which is to be given twice daily. This treatment caused the disappearance of the sugar from the urine in 15 of 46 cases. Eucalyptol and eucalyptus oil gave no results. Faulds is unable to state as to which constituent in the infusion the therapeutic effect is due.

GOUT.

The efforts to discover the underlying metabolic changes in this disease have led to much investigation during the past year, though the published results have added but little to our knowledge. Special attention has been devoted to the study of the purin bodies by Walker Hall,³ who has determined the purin value of many articles of diet which is set down in tables. Hall claims that by a quantitative estimation of the purin bodies in the food an exact forecast of the exogenous urinary purin is possible, and its amount can be limited when necessary by prescribing a certain diet. At the same time by subtracting the exogenous portion from the total urinary purin the endogenous portion can be determined. "The endogenous purin is partly derived from the leucocytes, but mostly from the cell changes which result in the maintenance of bodily functions, as its amount is proportional to the weight of the individual; in other words, it bears a direct relation to the metabolic activity necessary for systemic purposes. It is possible that the endogenous urinary purin represents about one-half of the total endogenous purin produced, and that the latter quantity indicates the extent of metabolic processes more completely than any other factors at present available."

Burian and Schur⁴ have come to the conclusion that of all the uric

¹ Loc. cit.

² British Medical Journal, May 24, 1902.

³ The Purin Bodies of Food-stuffs, etc., Manchester, 1902.

⁴ Pflüger's Archiv, Band lxxxvii.

acid carried in the circulation about one-half is excreted unchanged, while the remainder is destroyed, chiefly by the liver. The explanation of the excretion of unchanged uric acid is found in the blood distribution; the uric acid contained in the blood flowing through the kidneys is excreted unchanged. The exact relation in which uric acid stands to gout and its treatment has been discussed by His.¹ He believes that uric acid in gout plays the part of a disease product, and, besides, possesses pathologic properties. It is not, as formerly assumed, a product of incomplete albumin destruction, but is related to the so-called purin bases and originates from the nucleins. It occurs in the body partly as a result of nuclein metabolism, and in part out of the "Vorstufen," which are taken in with the food. Besides, it has been demonstrated by Burian and Schur and by Wiener that the mammalian organism is capable—like the bird—of producing uric acid synthetically. A portion of the uric acid is destroyed in the body, but the participation in this destruction by the leucocytes and liver has not been determined. The destruction, however, is not complete, since a portion, varying in different animals according to the species, is excreted through the kidneys and so withdrawn from destruction. In gout the production of uric acid is not increased, nor is its excretion through the kidneys made difficult. There remains, therefore, only the possibility that the destruction is diminished. Since now uric acid destruction is a "fermentative function" of certain organs, the disposition to gout arises in a weakening of this function. This weakness can be congenital or acquired, and, analogous with diabetes, the cases of gout can be grouped into (a) those in which gout appears early in life and without demonstrable causes; (b) those in which the tendency is inherited, but in which this tendency is increased by unsuitable mode of life; (c) the acquired form, under which are included the gout of brewers and lead workers. The first mentioned is the most severe, and the least amenable to treatment.

The cause of the attack of gout is as yet not clear. In pneumonia, leukæmia, and nephritis uric acid circulates in the blood, but no attack results. The previous explanations are not tenable; the alkalescence of the blood is not diminished, nor are primary necroses (Ebstein's theory) probable. Uric acid salts have a strong tendency to form supersaturated solution, and the conditions producing their precipitation are difficult to estimate in a reagent glass. For the localization of the deposit the salt content of the tissues is probably determinative. The uric acid acts partly as a foreign body producing irritation, which action disappears through fibrous encapsulation, and partly as a necrosis pro-

¹ Society Report, *Münchener med. Wochenschrift*, April 15, 1902, No. 15.

ducing tissue poison, but this only when in a soluble condition. Whether the deposits are painful or reactionless depends on the state of solution of the acid and its relation to its surroundings.

Luff¹ maintains that the gouty attack stands in close relation to sodium biurate without one being able to designate the latter as being the sole cause. The sodium quadriurate is probably a mixture of the biurate and uric acid. The biurate circulates at first in the blood in a colloidal and soluble form, but gradually passes into a crystallizable and insoluble condition, and causes, when deposited in the tissues, the gouty attack. The transformation into the insoluble form is hastened and increased by the sodium salts, and delayed and diminished by the potassium compounds. In gout the alkalescence of the blood is increased, corresponding to but not always parallel with the marked acidity of the urine.

Of particular interest in view of the generally prevalent opinion that in this country gout is infrequent is a paper by Fletcher² on gout in the United States. My own experience coincides in a measure with that of Fletcher as to the frequency of true gout, by which I would designate well-marked attacks of the articular variety and not the "goutiness" so commonly described at the present time. Within a few months three very marked cases have come under my observation, and my notes include a considerable series seen in private practice as well as in hospitals. Some of the most distinct cases I have encountered have been among the indigent class in the Philadelphia Hospital. I am convinced that many cases of gout are regarded as articular rheumatism, and that the small numbers recorded in hospital statistics in this country may in a measure be accounted for by this fact.

Gout in the United States. Fletcher reports 36 cases admitted to the Johns Hopkins Hospital out of a total number of medical admissions of 13,400, or 0.24 per cent. of the total admissions to the medical wards. For a similar period there were admitted to St. Bartholomew's Hospital, London, 116 cases out of a total of 31,100 medical admissions (0.37 per cent.).

PREDISPOSING ETIOLOGICAL FACTORS. *Heredity.* In 3 cases there was a definite history of gout in parents or grandparents. In 9 other cases there was a history of arthritic attacks described as "rheumatism" occurring in immediate ancestors.

Alcohol. Thirty-four patients used alcohol in some form; 2 of these 34 used whiskey alone. Beer seemed to be the beverage mainly used, although the beer-drinkers at times drank whiskey also, either moderately or in excess. None of the 36 used wine.

¹ Practitioner, March, 1902.

² Journal of American Medical Association, 1902.

Food. This seemed to be of little causal importance; 10 stated that they were heavy eaters, 5 being particularly heavy meat-eaters.

Lead. Only 1 of these cases gave a definite history of lead; he was a painter, who was admitted with lead colic. There were 8 cases in all whose occupations exposed them to lead poisoning; 5 painters and 3 tinsmiths.

Nationality. Twenty-seven were native-born Americans, 4 were born in Germany, 3 in Ireland, 1 in Canada, 1 in Finland. In none of the 9 foreigners was there a definite history of gout in the ancestors, although in 4 there was a history of "rheumatism."

Age. Youngest case, seventeen years; oldest, seventy-five, but he had his first attack at forty-eight. The majority of cases occurred between thirty and fifty.

Sex. All these cases were in males and all were white. No case of gout in a negro has come to the attention of Fletcher.

Social Position. Only 2 of these cases were admitted to the private wards. The majority were in the lower walks of life.

Occupation. As already mentioned, 5 were painters, 3 were tinsmiths, and 3 were bartenders or saloon-keepers, whose occupation makes them liable to be heavy drinkers.

Metabolism. The author does not go deeply into a discussion of this. The uric acid excreted by the kidneys was determined by the Hopkins method or the Folin modification. Almost invariably before the onset of acute symptoms the uric acid was found below and often far below 0.4 gm., the lower limit of the daily uric acid excretion in health. On the second or third day after the beginning of the acute symptoms the uric acid curve steadily rose, reaching 0.8 to 1 gm., the upper normal limit for the daily excretion, or even higher than this. With the subsidence of the acute symptoms the curve gradually falls below the lower limit of the normal, and in the interval between the acute attacks the excretion may be only 0.1 to 0.2 gm. daily. In one marked chronic case he failed to find any uric acid excretion whatever on certain days during the interval. Observations were made as to the relation between the uric acid and phosphoric acid elimination with reference to the acute attack. He found that the two curves ran almost parallel, the phosphoric acid curve rising with the uric acid curve during the occurrence of the acute symptoms and falling in the interval. This observation has an important bearing on the question as to the origin of uric acid, and strongly supports the view that the uric acid is largely derived from the body nucleins, phosphoric acid being a well-known product of nuclein disintegration. Bain has found a similar relation between the two curves. On the other hand, Chalmers Watson claims that there is no such association.

CLINICAL VARIETIES. *Acute Gout.* There were 3 cases admitted in the initial attack.

Chronic Gout. Thirty-three cases were of the chronic variety. The shortest duration of the disease before coming under observation was one and one-half years; the majority had lasted much longer.

Tophaceous Gout. Seventeen of the 33 cases of chronic gout had tophi; in 5 of these the tophi suppurated.

Cardiovascular System. Peripheral vessels showed sclerosis in 23 cases. Heart was moderately enlarged in 3 cases, and there was a mitral systolic murmur showing a certain grade of insufficiency in 5 cases; 1 case had distinct signs of myocardial disease and had persistent embryocardia.

Urinary System. In 14 cases the specific gravity of the urine was persistently below 1015. Albumin was present, usually in small traces, in 27, and hyaline and finely granular casts or both were present in 23. He calls attention to the fact that in none of these cases could uric acid be demonstrated in the urine either macroscopically or microscopically. Glycosuria was not present in any of the cases.

COMPLICATIONS. Bursitis occurred in 3 cases. Unilateral parotitis occurred once. This is a rare complication, but has occasionally been noted. Serofibrinous pericarditis was a terminal event in 1 case. This patient illustrated some of the features of retrocedent or visceral gout. The acute joint symptoms had practically subsided when marked abdominal symptoms manifested themselves. There was intense pain in the umbilical region with marked abdominal distention. These lasted for a week, gradually growing worse, and coeliotomy was done, thinking it intestinal obstruction or peritonitis. Nothing was found to explain the distention. The patient died a few hours later, the autopsy revealing a pericarditis and small, contracted, gouty kidneys. There was 1 case of acute eczema and 1 of herpes zoster.

MORTALITY. Two cases died—1 in uræmic coma, the other as just described.

DIAGNOSIS. This is simple, where there are recurring attacks, limited to the big toe and tarsal joints and occurring in a member of a gouty family. In cases where there is a multiple arthritis involving the larger joints the diagnosis of rheumatism is often made. This was done in 4 cases of this series, though admitted repeatedly, the proper diagnosis only being made when tophi appeared. In a case of arthritis with a doubtful diagnosis accompanied by persisting subcutaneous fibroid nodules the removal and histological examination of one of them may absolutely settle the diagnosis. As the statistics show these nodules are more frequently found in the ears, these should always be carefully inspected in multiple arthritis of doubtful origin. The con-

tents of any whitish, chalky-looking body occurring over the cartilage of the ear should be examined microscopically. The finding of the characteristic acicular needles of sodium biurate settles the case as one of gout. Small fibroid nodules, Woolner's tip, and minute sebaceous cysts may be mistaken for tophi, but the microscope serves to differentiate them. The character of the uric acid curve can be used in institutions. The occupation should be carefully investigated. The occurrence of recurring arthritic attacks in painters, plumbers, brewers, and saloon-keepers should lead one to strongly suspect gout.

The discussion of Fitcher's paper is of interest as showing the experience of clinicians in various localities of the United States.

R. C. Cabot, of Boston, could find only 4 cases of gout in 28,000 cases admitted to the Massachusetts General Hospital in ten years. He believes there are considerable grounds for the belief that gout is rare in this country.

James J. Walsh, of New York, thinks that a certain number of cases of so-called rheumatism that fail to respond to the salicylates are probably gout.

George Dock, of Ann Arbor, Mich., states that he very rarely finds gout in his locality.

Allen A. Jones, of Buffalo, observed that gouty nephritis being so constant and common and nephritis being associated so persistently with alcohol and lead poisoning had led him to consider the gouty manifestations as really a chronic intoxication. The nephritic manifestations being coincident with the gouty manifestations made him think that possibly they were due to the same causes.

J. A. Witherspoon, of Nashville, Tenn., mentioned a case in a negro with typical attacks in the big toe and tophi that showed biurate of sodium under the microscope.

Fitcher, in closing, stated that the temperature was nearly always elevated in the acute cases to 102° or 103°. He thinks that there was a slight leucocytosis in the acute stage.

In a number of cases he tried the Garrod thread test, but failed to demonstrate crystals.

Acute Gout of the Pharynx. Lemoyez and Gasin¹ report the following case: A man, aged fifty years, who had never suffered from gout previously, was suddenly seized with severe pain in the throat accompanied by fever. The pharynx was markedly swollen and of a dark red color. The condition progressed until swallowing was interfered with. On the eighth day of the disease the appearance was

¹ Société Méd. des. Hôp., March, 1902; report in *Münchener med. Wochenschrift*, No. 18, 1903.

that of a suppurative periamygdalitis, and surgical intervention was advised, but was refused by the patient. The next morning the entire swelling had disappeared, neither blood nor pus having been spat out, and the throat looked to be almost normal. Simultaneously there appeared a typical attack of gout of the great toe of the opposite foot. Such cases are rare, only five or six having been published. The diagnostic points of gouty angina are the rapid onset with great local pain and constitutional symptoms, the diffuse redness and swelling extending beyond the pharyngeal limits, and the absence of exudates and glandular swelling, together with the age of the patient.

Gout in Children. According to Comby¹ the gouty diathesis transmitted by the parent to the children manifests itself but rarely in the form of typical arthritic gout. In childhood—that is, from birth to puberty—certain gouty equivalents are met with. As a rule, the children of gouty parents are well developed bodily, but are of a nervous, irritable temperament, restless, disobedient, precocious, and intelligent. In general, two types may be distinguished: the thin and the fat. A special type is formed by lymphatic children who tend to diseases of the tonsils, pharynx, glands, etc., and the anæmic, in whom chlorosis generally appears later on. The gouty equivalents show themselves in different ways in the different systems of the body. On the part of the circulatory apparatus is mentioned the frequent occurrence of cardiac arrhythmia in neurasthenic children at puberty. In the respiratory tract is noted a tendency to catarrhal diseases, spasm of the vocal cords, and hay fever is said to occur only in arthritic families. In the digestive organs many disturbances are observed, of which periodically appearing attacks of obstinate vomiting may be mentioned, which, combined with headache and weakness, often leads to the suspicion of meningitis. Especially marked are the symptoms referable to the nervous system. In the nursling periodical eclampsia is seen, and in childhood migraine, periodical cephalalgia, chorea, hysteria, etc.

Besides this, there is a tendency to spasm in all infectious diseases. On the part of the skin is seen a tendency to erythema, urticaria, and, above all, to obstinate eczema. Besides this oedema of the eyelids occurs. Genito-urinary manifestations are stone formation, floating kidney, vulvitis, and menstrual disorders. Finally is mentioned arthritic fever, which often appears periodically without local manifestations from the third year to puberty. The proof that the above-mentioned disorders are to be looked upon as gouty equivalents is obtained from the urinary examination and from the results obtained from proper dietetic treatment.

¹ *Klinische therapeutische Wochenschrift*, 1901, Nos. 41–43.

Treatment. According to His¹ the therapeutic objects consist in :

1. To guard the uric acid-destroying function of the body ; analogous to diabetes is an improvement of the function to be expected through care of it. The form of diet prescribed can be varied individually within a wide range, providing that moderation is insisted on and excess of meat and alcohol avoided.

2. To diminish the uric acid production. Meat and foods rich in nuclein need not be absolutely avoided, since they influence the uric acid excretion distinctly only when taken in excess. Quinic acid, according to late investigations, diminishes the uric acid formation not at all or only under certain limited conditions.

3. To increase the destruction of uric acid. For this purpose a general stimulation of metabolism through bodily exercise is indicated.

4. To increase the excretion of the uric acid. Drugs, as salicylic acid, which have this property, act only for a short time, and in chronic gout experience teaches that they are inactive. The action of salicylic acid in the acute attack is very likely due to its specific analgesic action on the joint.

5. To increase the solubility of the deposits. Physiological chemistry investigations have shown that this cannot be done by remedies which form easily soluble salts, as lithium, piperazin, lysidin, etc., or alkaline mineral waters. The action of these remedies is in part uncertain and in part unknown.

6. To stimulate the circulation in the affected part. The attempt is made to stimulate the phagocytes as well as to increase solution. Baths, hot air, massage, etc., are indicated.

7. The manner of action of colchicum, iodine (iodides?), and guaiac is absolutely unknown.

Luff² recommends potassium salts combined with colchicum for chronic gout, while as a prophylactic he believes in guaiacum resin, thinking it possesses properties of hepatic stimulation. This should be given only in the form of the powdered resin in cachets of five grains after meals, gradually increasing the dose to ten or twelve grains. He also believes in the efficacy of quinic acid, though his experience with the drug is limited.

As to diet no absolute rules can be given. Generally speaking, it should be somewhat limited and simple, and varied according to the patient. Baths, massage, heat, etc., are valuable adjuncts in properly selected cases.

Spring³ advises discretion in the selection of the diet. While in the

¹ Loc. cit.

² Australasian Medical Gazette, July 21, 1902.

³ Loc. cit.

acute attack meat may be left out, in the intervals there may be times, and patients who thrive best on a plain meat diet, just as there are others, mostly rheumatic, who have come to regard a vegetarian diet as their salvation. The value of plenty of water, free exercise, and free skin action are apparent. Likewise the importance of protection against chill by clothing and climate is obvious. He, too, advises the frequent use of alkalies and the avoidance of alcohol.

MYXŒDEMA.

Myxœdema in Infants. Numerous articles have been published during the past year concerning the various forms of myxœdema seen in infants, and many divisions or classifications have been suggested. Pineles,¹ after a careful consideration of the literature, has concluded that three distinct types of the disease are to be met with: 1. Thyreoplasia (congenital myxœdema). 2. Infantile myxœdema. 3. Endemic cretinism. The etiological factors in the first are chronic alcoholism, tuberculosis, or neuropathic taint in the ancestors, and a family tendency is at times noted. In the second type the same factors are active as in the idiopathic myxœdema of the adult, while in the third variety there is an unknown infectious agent.

THE PATHOLOGY OF THE THYROID. In the first class of cases there is a malformation in the sense of a thyroid agenesis; in the second there is an atrophy of the gland; in the third there is a strumous degeneration of the gland, or often an atrophy.

CLINICAL VARIATIONS IN DISEASE PICTURE. In the first class of cases there is a severe grade of myxœdema with a marked disturbance of growth. The second form shows usually mild symptoms, while the third may be mild or severe.

COURSE OF THE DISEASE. In the first case there is a distinct manifestation of the beginning symptoms in the second half of the first year or later. In the second group the symptoms first show themselves from the sixth year on. In the third variety the symptoms appear in the first year of life.

SEX. In both the first and second varieties females are decidedly more frequently affected than males, while in the third class of cases the males are slightly in excess.

DISTRIBUTION OF THE DISEASE. The first variety occurs in all countries; the second is met with chiefly in England and Belgium, and the third in certain distinct regions where goitre is common.

¹ Wiener klin. Wochenschrift, 1902, No. 43.

Meige¹ writes of the same conditions under the title of "Infantilism," of which he recognizes two types—"myxœdematous infantilism" and "infantilism of the type of Lorain."

Kassowitz,² out of his very large clinic for children, observed a number of cases which in some way resembled each other, but did not respond similarly to the use of thyroid extract. He has separated these cases into three classes: 1. Myxœdema. 2. Mongolismus. 3. Micromelia. The symptoms common to all are the cretinoid face; the late closing of the fontanelles; the open sutures which are not, like rickets, bordered by soft, yielding bone edges, but by hard, firm bones. Dentition was delayed in the cases of myxœdema and mongolismus, but was normal in micromelia. The growth in length was delayed in all cases of myxœdema, involving the entire skeleton proportionately, while in the micromelic the body was normal and the head generally enlarged, but the extremities were markedly shortened, almost one-half the normal. In mongolismus the size was sometimes below the normal, but this was not noted to a marked degree, and often there was the usual length or even an increase. The formation of ossification centres in the short bones is greatly delayed in myxœdema, while in the other conditions it is normal, or in micromelia there is often an unusually early ossification, and the cases of premature synostoses of the base of the skull are believed by Kassowitz to occur only in this condition and never in myxœdematous cretins. All varieties showed an excessive laxity of the joints, most marked and most frequent in mongolismus. Malformations of the ear were common to all, but most frequent in mongolismus. In a large proportion of the cases of myxœdema and mongolismus there was an umbilical hernia, less frequently an inguinal hernia. In both types oligochromæmia and marked constipation were present. In micromelia hernia was occasionally present, but the blood and bowels showed no abnormality and the sweat secretion was normal, as it was in mongolismus. In myxœdema, on the contrary, there was usually a low temperature and diminished or absent sweat secretion. The psychical development in the micromelic cretins was normal, while in the other types it was markedly retarded.

In all these cases—twenty-two of myxœdema, seventy-five of mongolismus, and seven of micromelia—thyroid medication was tried in the form of "thyroid elixir," each coffeespoonful representing one-sixth of the active substance of a sheep's thyroid. Children under one year received one-half a coffeespoonful; children over a year a full spoonful, and those over ten years up to two spoonfuls daily. The result of treat-

¹ Gazette des Hôp., 1902, No. 22.

² Wiener klin. Wochenschrift, 1902, Nos. 22-30.

ment varied with the type of the disease. In the myxœdematous cases the improvement was rapid, the myxœdema disappearing promptly. In the mongoloid cretins there was no change in the amount of panniculus, nor was there a disappearance of the thickened folds of skin on the shortened extremities in cases of micromelia. The thyroid substance hastened the closure of the fontanelles and dentition in both myxœdema and mongolism, and in the former it stimulated the growth in length to a marked degree. In micromelia there was a gradual equalization of the disproportion between the body and extremities, but this did not seem to be due to the medication. The laxity of the joints seemed to be unaffected, but there was marked influence on the umbilical hernia in all of the cases. In the myxœdematous cretins the temperature returned to normal, the sweat secretion appeared, and the constipation both in these cases and in mongolismus was cured. The effect on the mentality was especially well marked in the myxœdematous cretins, going on to such improvement that the child could attend school regularly. In the mongoloids, however, at most there occurred a quick improvement in the sleepiness and apathy, but then appeared a complete standstill or so slow an advance that it might well have been independent of the therapy.

Engelmann¹ discusses *sporadic cretinism* at length, and suggests that this condition in children be called "sporadic, infantile, congenital, and acquired athyrea." As diagnostic characteristics of this disease in childhood and infancy the most important are:

1. Absence of atrophy or disease of the thyroid gland.
2. Mental torpidity and physical backwardness.
3. Weak musculature.
4. Paleness, puffiness, and dryness of the skin, with later a thickening and inelasticity of underlying tissue.
5. Abdominal distention.
6. Constant existence of umbilical hernia that disappears promptly on thyroid feeding. Parker and Sargent call attention to this defect that in histories, at least, is overlooked, but always illustrated in the pictures of cretins, they say.
7. Obstinate constipation.
8. Not a retarded but a rudimentary dentition, evolutionarily parallel to that of a normal child of the same length or height as the cretin.
9. A brachycephalic skull and a general skeletal arrest, more marked in the long bones; a dwarfism due to slow enchondral and osteal diaphyseal progression, but not to an epiphyseal, cartilaginous, hyper-

¹ Journal of the American Medical Association, February 14, 1903.

plastic growth and an excessive deposition of the bone-cells as seen in rickets. The process is slow, lineal, symmetrical delay of ossification rather than an epiphyseal and periosteal overgrowth.

10. A radiographic verification of this fact, demonstrating the parallelism and symmetrical development of the long bones of the cretin as compared to that of a normal child of corresponding height, but not of corresponding age.

11. A radiographic exhibition of the absence of partial or backward evolution of the small bones of the hands, contributing, with the associated shortening of the phalangeal and metacarpal bones, to the spade-like appearance of the hands.

12. The presence of Koplik's stigma of degeneration, viz., an excessive prominence of and over the os pisiformis separating the wrist crease from the antithenar prominence. Koplik does not believe that this deformity is consequent on pressure from crawling, since he has seen it in a three-months-old babe.

13. Diminution of the white and red blood-corpuscles and the hæmoglobin percentage. A progressive anæmia.

14. Small heart, slow and almost impalpable pulse, cold and mottled surface, subnormal temperature.

15. Suprascapular and supraclavicular and other connective tissue or colloid pads.

16. Hoarse, low-pitched cry and voice.

17. Peculiarities of posture and gait, manifested when standing by a broadened base and by a swaying of the body when the feet are brought together with closed eyes and a sluggish gait.

Mills¹ reports a case in a girl whose symptoms first began at the age of five years. At the time of writing she was twenty-six years of age, and from the history it was learned that at the age of twenty-one she had been under thyroid medication for some time with marked improvement. With omission of the thyroid this improvement failed to continue. After two years without thyroid treatment she was seen by Mills, who placed her on thyroïdine and improvement, though not marked, was observed. These cases serve to illustrate the very evident fact that in the cretinoid conditions of children all grades may be met with. If, as seems to be certain, the thyroid gland is at fault it is not difficult to imagine that, depending on the extent or degree of involvement of the thyroid function, more or less severe types of the disease occur. Another point to be considered, however, is the possibility of a vicarious action on the part of other ductless glands, as the pituitary and thymus glands. Jacobi (discussion on Engelmann) has mentioned

¹ New York Medical Journal, February 22, 1902.

this correlation in function of the ductless glands, and in myxœdematous conditions where thyroid treatment is unsuccessful advises the administration of extracts of the other ductless glands. Mendel¹ insists on the necessity of thymus gland activity in the growth of the body, especially the bones, during the first year of life, and attributes rachitis to a failure of this action.

Many factors have been looked upon as causal in myxœdema, and the cases of MacIlwaine² are of interest in that they seem to point to a toxic or infectious etiology.

Myxœdema in Mother and Child. MacIlwaine³ reports the case of a woman who had been practically always well until 1895; when she was seized with a severe and persistent attack of which vomiting and diarrhœa were the prominent symptoms, and later phlebitis. To this was finally added tachycardia and palpitation, which became the dominant symptoms, with thyroid enlargement. Believing that some sanitary defect in the residence brought about this toxic condition the patient moved to another town, where she slowly improved. The diagnosis of Graves' disease was made at the time. The whole illness lasted three years (1895 to 1898), but ever since severe palpitation has given trouble. The thyroid is now hard and enlarged on one side, the hair has fallen out to a considerable extent, and has changed in texture. The skin has never been moist except at the nape of the neck, and has become harsh, especially on the palms of the hands. She improved rapidly on three months' treatment on thyroid extract, and this makes the diagnosis certain that the condition was myxœdema. The patient gave birth to a child in 1899, which was exceptionally bright and healthy until one year of age, when it was seized with dysenteric diarrhœa, large amounts of blood being passed. As influenza was prevalent this was thought to be the cause. The child was removed from London and immediately began to improve, but for three months there were recurring attacks of jaundice, and the child was too weak to be up. From this time on the child put on flesh, but could neither talk nor walk and became a typical cretin. Thyroid treatment produced very satisfactory results.

Some years ago the author reported two cases of myxœdema—one in a man following influenza, the other following an anæmia subsequent to a severe post-partum hemorrhage in a woman. The cirrhosis of the thyroid resulted apparently from the toxic state of the blood associated with anæmia. In these four cases the myxœdematous state was clearly secondary to some pre-existing toxic condition.

¹ Münchener med. Wochenschrift, January 28, 1902.

² British Medical Journal, May 24, 1902.

³ Loc. cit.

Myxœdema in Adults. The salient points of the disease in adults are so well known that no especial reference need be made concerning the symptomatology. The following cases reported by Bialobszeski¹ under the name of *myxœdema fruste* are of interest as representing some of the varying degrees of the disease. The first case was in an unmarried woman, aged thirty-eight years, whose family history showed a neuropathic taint. Menstruation began at fifteen and ceased at thirty-five. When examined she was found to be somewhat emaciated. She complained of insomnia, a tendency to weep on slight provocation, mental depression and weakness in thought, hallucinations, and loss of appetite. The face and neck as well as the nose, mouth, ears, and eyelids were œdematous. The eyelids were thick and cyanotic, almost completely closing the eyes. The gums were swollen and the teeth gone. The hair was almost entirely absent. The œdema of the skin ceased gradually at the clavicular and scapular regions. The swollen skin was hard, smooth, and bronze-like. (Edema was also present on the dorsal surface of the hands and feet. The second patient, also a woman, was forty years of age and married. The menopause occurred eight years previous. For six years she had noticed swelling of the face and neck, varying in degree from time to time—now less and now more marked. For six months there had been a gradual increase in the œdema, apparently first in the region of the eyes and mouth, and later affecting the forehead and neck. Along with this appeared dyspnœa, pain in the neck and head, dulness, insomnia, nervousness, and a tendency to weep. When examined the face was greatly swollen, the nose and eyelids red and œdematous, lips thick, gums red and swollen, as was the tongue. There was marked salivation. The thickening was present in the neck and ears. The skin was hard and dry and did not pit on pressure. The œdema ceased at the third intercostal space; but on the left forearm there was an œdematous girdle about four fingers' breadth, and there was thickening on the thighs, where the skin was dry, pale, and stretched. The kidneys and heart were perfectly healthy.

While these cases represent the benign form of the disease—the *myxœdema fruste* of Herthoge—it is possible that they may be only the early stages, and if untreated would go on to complete development of the malady.

Treatment. This consists essentially in the administration of some one of the numerous preparations of the thyroid gland. The results are generally gratifying in true myxœdema, but occasionally cases are met with which are apparently unaffected. In this event the

¹ Abstract in Fortschritte der Med., 1902, No. 27.

suggestion of Jacobi¹ to combine extracts of other ductless glands with the thyroid extract should be remembered. Occasionally good results are reported from the use of iodine, as in the two cases of Bialobaszewski just mentioned, both of whom showed distinct improvement on this medication.

EXOPHTHALMIC GOITRE.

The past year has been especially prolific in publications on this subject, the majority, however, being directed to a consideration of the treatment. The most important of these articles is that of Kocher,² which is based on a consideration of ninety-three cases, all most carefully observed, and in twelve instances metabolism investigations were carried out. These gave no constant results; in some instances there was an increase in the urea and uric acid excretion, while the phosphoric acid excretion was normal. Lasting glycosuria was present in two cases, and in only a few was a marked transitory alimentary glycosuria noted. Kocher inclines to the belief that an abnormal secretion of the thyroid lies at the bottom of the disease.

The opinions as to the pathogenesis of exophthalmic goitre are by no means uniform, the main contention being as to whether it is of nervous origin or whether it is a disease or an anomaly of the gland itself. In support of the former may be mentioned the work of Tedeschi³ carried out on dogs. This investigator found that if the restiform bodies were injured in the anterior portion just behind the acoustic tubercles most of the symptoms of exophthalmic goitre appear, namely, exophthalmos, enlargement of the palpebral fissure, tachycardia, generalized tremor, and sometimes polyuria, glycosuria, and abundant salivation. In rabbits the pupil dilates; in dogs the primary dilatation gradually lessens. The experiments, however, were not conclusive as to the effect on the thyroid gland. Dana⁴ believes "that the primary disturbance of the disease is in the cerebral centres, and particularly those which control the nutrition of the thyroid and regulate the action of the circulation. These centres are constitutionally weak, as is shown by the almost uniform neuropathic personal and family history of the cases. They are weakened further through emotional strain and infections and by combinations of both." The two cases reported by Dana seem to support his view as to there being a nervous basis in the disease.

The first case occurred in a woman, aged twenty-three years, whose family history was negative. She had had measles when a child, and

¹ Loc. cit.

² Mittheilungen aus den Grenzgebiet der Med. u. Chir., Band ix., Heft 1, 2.

³ Gaz. degli. Osped., April 6, 1902.

⁴ New York Medical Journal, June 14, 1902.

for six years previous to admission had had fainting spells, but no convulsions. Menstruation was irregular. It was not known how long the disease had really existed, but severe symptoms began one month before admission with headache, nausea, and vomiting, which lasted a week. After slight remissions the symptoms returned. Examination showed anæmia, double exophthalmos, enlargement of the thyroid gland, especially on the right side, some blepharospasm, visible pulsation of both carotids, and a thrill over the thyroid. The pulse was 88 in the morning and 108 in the evening. Temperature, 99.5°. The heart showed an anæmic murmur at the apex with enlargement of the left ventricle. During the next two weeks she had much headache, rapid pulse, tremor, sweating, and nervousness, insomnia, and occasional attacks of vomiting. Seventeen days after admission she became stuporous and was unable to swallow, and on the day following there was noticed some paresis of the right side of the body and ptosis of the left eyelid. She died on the following day. The autopsy showed the kidneys, heart, and lungs to be normal, as were the viscera except the brain. Both the thyroid and thymus glands were enlarged. The meninges were congested, and a definite area of softening was found involving the outer side of the left crust and part of the adjacent pons. This softening was about one inch in diameter and showed no central hemorrhage. Dana thinks the lesion must have been due to thrombotic or embolic distention. No lesion of the cells of the cranial nuclei or any lesion of the brain was found.

The second case was also a woman, aged forty-five years. She had been well until nine months before admission (June 16, 1896), when symptoms of exophthalmic goitre developed. On June 10, 1896, she suddenly lost consciousness, and had twitching in the right foot. This was followed by right hemiplegia and aphasia. When admitted she showed tachycardia, exophthalmos, etc., and there was a bronchitis. The spleen and liver were enlarged. The aphasia was of the motor type and not complete. She became able to walk. The knee-jerks were exaggerated, the superficial reflexes diminished on the right side, and there was distinct hemianæsthesia also on the right side. She died of exhaustion on October 24, 1896. The autopsy showed some hydrothorax, chronic circumscribed pericarditis, gummata of the liver, infarction of the kidney, atrophy of the medulla and adrenals, hypertrophy of the thyroid, and persistence of the thymus gland. There were circumscribed areas of softening of the brain cortex on both sides in the right inferior parietal lobule, and in the third left frontal convolution. The softening extended into and involved part of the internal capsule. There were no changes found microscopically in the bloodvessels or evidences of specific disease (?).

The nuclei of the twelfth and to a less extent that of the tenth showed striking degenerative changes.

Still others who advocate the nervous theory look upon the sympathetic as being at fault, hence the advocacy of sympathectomy as a cure. A case resembling those of Dana in so far as nervous symptoms are concerned, but which is explained on other grounds, is reported by Rosenfeld.¹ The patient was a young man, aged nineteen years, in whom positive signs of Basedow's disease existed for a year, but which in no way interfered with his occupation mentally or physically. After a prodromal stage of three days, during which he complained of pain in the back and weakness of the legs, there appeared under symptoms of collapse a palsy of the right leg with complete loss of tendon phenomena. The palsy extended to the left leg and then to the muscles of the body, and finally involved the muscles of the arm and neck. No disturbances were noted in the nuclei of the medulla, and the sensibility was normal. This condition lasted twenty hours, at the end of which time movement gradually returned, marked muscular weakness remaining. There were no hysterical stigmata. This condition recurred twice to a less marked degree in the next few days. Now appeared a marked exhibition of the Basedow's symptom-complex—tachycardia, acute exophthalmos, acute enlargement of the thyroid, emaciation, sweating, and delirium. Rosenfeld thinks hysteria was positively excluded, and looks on the condition as an acute intoxication.

There is little to be said that is new concerning the symptomatology. At a meeting of the Royal Medical and Surgical Society of London² Murray gave statistics based on 120, and Mackenzie gave some particulars of 52 cases of exophthalmic goitre, in which the frequency of occurrence of the various symptoms was considered.

Acute Exophthalmic Goitre. The case of Dana, already mentioned, may be included under this heading, to which may be added an instance reported by Campbell.³ The patient, a young woman, aged twenty-seven years, was first seen on March 27, 1901, at which time she mentioned having a swelling of the neck which had appeared a few days before. At this time she presented no other symptoms. She was next seen on October 14th, when three teeth were drawn. She looked rather pale, but no other symptoms were noticed. On the 16th she became feverish, pulse became 112, and she complained of pain in the side. On the 18th she complained of precordial pain, the pulse was 144, and there was violent pulsation of the heart and abdominal aorta.

¹ Berliner klin. Wochenschrift, 1902, No. 23.

² Report in the Medical Record, November 29, 1902.

³ British Medical Journal, March 15, 1902.

She was trembling slightly all over. Temperature was normal. On the 19th the eyes became prominent and Graefe's sign appeared. Vomiting began on the 29th, and on November 15th she became jaundiced and death occurred on November 27th. No autopsy was allowed. When first seen the patient was given syrup of hydriodic acid in drachm doses t. i. d., but the author thinks that the renewed prescription given later was not taken, and so excludes the possibility of the iodine being the cause of the acute condition.

That iodine can cause *thyroidismus* even in very small amounts has been specially noted by Breuer, who has recently reported two new cases.¹ The first patient, a woman, had had a growing goitre and perhaps some slight symptoms of Basedow's disease. Coincident with the administration of small quantities of iodine she developed a severe, almost fatal thyroidismus which lasted some weeks after the omission of the drug. She finally regained her former condition completely. The second patient, a woman, aged twenty-five years, was always healthy and had never had goitre previous to the onset of the present condition. Seventeen years before she had been infected with syphilis, and had undergone repeated treatments by inunction. In the spring of 1900 she developed a syphilitic iritis, on account of which she was given potassium iodide in doses of 1 to 1.5 gm. (15 to 22 gr.) thrice daily. This was taken from March to the end of August, 1900. In the middle of August she began to emaciate rapidly, and within a few weeks lost 7 kilos (17½ lbs.) in weight; at the same time psychical irritation and cardiac palpitation appeared. These symptoms remained, although the iodine was omitted in the beginning of September, and the emaciation increased. About the beginning of November the patient presented the typical symptoms of thyroidismus, but exophthalmos and goitre were not present. In February, 1901, a goitre gradually developed, and in March, 1902, exophthalmos was noted. Under the influence of bromides and careful diet the patient was able to work, but the pulse remained at about 110; there is distinct exophthalmos, especially on the left; moderately enlarged, slightly pulsating goitre, and occasional attacks of diarrhoea. Breuer believes this to be a true case of Basedow's disease arising from constitutional iodism.

Basedow's Disease in Children. While the symptoms presented differ in no way from those in the adult, the infrequency of the occurrence of Basedow's disease in children renders such cases of interest. Ovassa² reports three cases in children aged five, seven, and eleven years. According to this author only a dozen cases in all have been

¹ Wiener klin. Wochenschrift, No. 33, p. 855.

² Riforma med., April 16, 1902.

published. In the *Wiener klinische Wochenschrift*, 1902, No. 7, p. 185, von Roy is reported to have shown a case with typical symptoms in a boy aged four and one-half years.

Treatment. So many drugs have been used and reported as successful in the treatment of Graves' disease that a list of them is of no particular value. Considerable attention has been given of late to the use of serum from animals whose thyroids have been removed. Schultes¹ reports good results from such treatment in a patient who, besides the exophthalmic goitre, was suffering from an attack of acute insanity when first seen. She was given 0.5 c.c. (8 μ) serum "antithyreoidin" thrice daily by injection, increasing each dose by 0.5 c.c. until 4.5 c.c. (68 μ) t. i. d. was reached. At the end of thirty-one days there were no subjective symptoms, the mind was clear, and the pulse had fallen from 140 to 88. The treatment was gradually decreased and stopped on the thirty-fourth day. A week later the pulse became again rapid—112—and though no subjective symptoms appeared she was given 2 c.c. (30 μ) of serum t. i. d. for a week, at the end of which time the pulse was 90. She was discharged cured. Goebel² reports marked improvement with the use of milk from a goat whose thyroid had been extirpated. The good results obtained by Moebius from "anti-thyreoidin" were mentioned last year. Sörgo³ gave his patient the powdered dried flesh of a dog whose thyroid had been removed. The dose was 40 gm. daily, equal to $\frac{1}{4}$ kilo of fresh flesh. After three weeks the stomach rebelled, and it was discontinued. Not the slightest change was noted.

Abodie and Collom⁴ report the results from injections of iodo-ether in twenty-four cases of exophthalmic goitre. This treatment was first recommended by Pitres in 1899, the solution consisting of 4 gm. (60 gr.) of iodoform in 20 gm. (5 $\bar{3}$) of ether. Of this solution 1 c.c. (16 μ) was injected at a time in the most prominent part of the thyroid, avoiding any large vessels. The results are appended:

1. A notable diminution in the volume of the thyroid occurs at the time of injection, and among the subjective feelings are a sense of swelling of the neck and slight choking; pinching and darting pains are felt on the side of the neck, jaw, face, and ear, and a short, dry cough may be excited.

2. No inflammation was noted as a result of injection, and only in one of the twenty-four cases was there any untoward symptoms, namely, fainting.

¹ Münchener med. Wochenschrift, 1902, No. 20.

² Ibid.

³ Wiener klin. Wochenschrift, No. 33, p. 856.

⁴ Revue Neurologie, January 30, 1902.

3. The age of the twenty-four patients varied from fifteen to fifty years, and the exophthalmic goitre occurred in all degrees of severity.

4. When partial improvement occurred injections were given at intervals of a few days until improvement was complete. Such improvement included the disappearance of such symptoms as cephalalgia, agitation, emotional irritability, amenorrhœa, polyuria, and neuralgic pains about the eyes. Then followed abolition of tachycardia and anginal attacks, trembling and exophthalmos, while the appetite returned and strength improved so that work could be resumed.

Twelve cases were cured; nine showed notable and permanent improvement; three temporary improvement. Injections were made under strict aseptic conditions.

Perhaps the greater amount of attention has been directed to the surgical treatment, of which there are two chief varieties: those directed to extirpation of a portion of the gland, often combined with ligation of the vessels leading to the part remaining, and sympathectomy. The results, indications, etc., were thoroughly discussed in the preceding number of *PROGRESSIVE MEDICINE*.

ADDISON'S DISEASE.

Considerable attention has been directed to the study of the suprarenals with a view to determining their functions, but the matter is by no means definitely settled. Vassale and Zangro¹ have carried out some investigations on the effects produced in animals by removal of the medullary portion of the adrenals. If the entire medulla was removed, only a small portion of the cortex remaining, the animals died promptly with the symptoms observed when total removal was carried out. If some of the medullary portion was left behind, the animal died within a few weeks, showing cachexia, loss of appetite, asthenia, subnormal temperature, and great emaciation. This, they believe, shows that the medulla of the gland must have some special function.

Wiesel,² in discussing the development, believes that the medulla of the suprarenal is derived from the sympathetic. In a very early stage of embryonal life there is no connection between the sympathetic and the adrenals. Later on cells form in the nerve fibres which resemble in a measure lymphoid cells, and to these Wiesel gives the name of "sympathetische Bildungszellen." Later on these cells wander into the cortical substance, being first in the periphery and later on more centrally, where collections of cells occur which must be looked upon as

¹ *Riforma medica*, October 31, 1902.

² *Wiener klin. Wochenschrift*, 1902, No. 8, p. 220.

the future medulla. This inwandering of cells goes on even after the embryonal stage, and is accompanied by a transformation of the sympathetic "Bildungszellen" into "Chromaffin" cells, out of which the entire medullary substance is formed with the exception of a few ganglion cells. The development of the medullary substance can, therefore, be divided into two stages: 1. Inwandering of the sympathetic "Bildungszellen." 2. Transformation of these into "Chromaffinen" cells. Both stages can be demonstrated after the period of embryonal life.

J. Bruno¹ reports two cases of Addison's disease:

Case I. A man, aged thirty-nine years, with a tuberculous family history, began to feel weak in October, 1900, and during the winter of 1900 and 1901 he had persistent cough, and fever often occurred. In the spring of 1901 he complained of "rheumatic" pains in the legs and neuralgic pains in the lumbar and inguinal regions. At the same time there appeared a diarrhoea, which persisted, and for two months before admission he had had repeated vomiting and much pain in the abdomen. As a result of this there was great loss of flesh. Dating from the spring of 1901 the face and back of the hands had shown a gradual increasing brownness. The patient had also shown some psychical disturbance for a short time before admission—July 17, 1901.

He died four days after admission.

Autopsy. Bronze color of the face, hands, genitalia, buttocks, and mucous membrane of the mouth. The lungs showed lesions of phthisis. The spleen was but slightly swollen. Hæmochromatose of the intestines. Both adrenals were enlarged, and completely changed into caseous masses and fibrous tissue. Apparently no true gland tissue remained. The kidneys were negative; the liver was normal in size, but strewn with numerous bluish-black flecks about the size of a pin-head. The gall-bladder and ducts were normal. The brain, vagi, and sympathetics were negative.

Anatomical Diagnosis. Morbus Addisonii; tuberculosis of both adrenals; chronic indurative tuberculosis of both lungs; double adhesive pleuritis; myodegeneratio cordis; liver flecks.

Under the microscope the liver flecks were found to be centro-acinar pigment deposits that contained no iron.

Case II. Male, aged twenty-five years, with a negative family history. He was said to have been healthy until five years before observation. At this time he became weak and lost flesh, and at the same time he began to have pain in the right side, which has since remained.

Pain was never marked, but he was always conscious of it. At the same time he noticed that a dark discoloration of the skin was appear-

¹ Münchener med. Wochenschrift, January 28, 1902.

ing, beginning on the body, in the hip region, and in the axillæ. For some years the patient had suffered from cough, expectoration, and night-sweats. Hæmoptysis occurred one year previous for the first time, and had been repeated several times since. On admission he complained of cough, expectoration, great weakness, chills, night-sweats, diarrhœa, insomnia, and spontaneous pain in the abdomen. He had been impotent for one and a half years. Examination revealed the evidences of right-sided phthisis and marked pigmentation of the skin, best shown on the face, which was a bronze-color with patches of darker pigment scattered around, with some flecks on the scleræ. The folds of the neck, corresponding to the collar of the shirt, were deeply marked. On the chest there were dark brown spots, and a vaccination mark was also pigmented. The extensor surfaces of the hands and feet were bronze in hue, while the flexor surfaces were not discolored. Especially deep was the pigment around the genitalia. Excessive secretion of yellowish sweat was also noted. No swollen glands could be found. The stools were diarrhœic; the urine dark, but contained no albumin or sugar. Tubercle bacilli were found in the sputum. The blood-count showed red cells, 4,592,000; white cells, 7000. Under treatment along general lines the patient improved and was discharged.

With the blood of this patient the author carried out the suggestion of Neusser. (Brown-Séquard and Abelous and Langlois have shown that the blood of frogs from whom the adrenals have been removed is capable of producing, when injected into normal frogs, symptoms similar to curare, and when injected into frogs whose adrenals have been removed will hasten the death of the animal.) Neusser suggests that the blood of man suffering from Addison's disease possesses also this toxic action, and by injecting animals with the serum from suspected cases of Addison's disease we have a sensitive diagnostic reaction.

It has been found by authors mentioned above that removal of one adrenal brings about no effect. Removal of one and part of the second adrenal generally leads to death, unless a large piece of the second is left behind, when death appears late. Removal of both adrenals causes death in summer frogs in forty-eight hours, and in winter frogs within fourteen days. If a piece of adrenal is implanted in an animal before the double extirpation the operation can be borne; if now this piece is removed death occurs. Injection of adrenal extract prolongs the life of the animal. Bruno carried out this procedure with the blood from his second case, and could find no difference in the toxic action of serum from the patient with Addison's disease and the serum from a normal man, so far as the effect on the frogs was concerned.

He calls attention to the fact that this second case belonged to the

chronic and prognostically favorable type, and a strongly marked toxicity of the blood was scarcely to be expected. He advises that the experiment be tried in suitable cases.

An especially interesting case is reported by Pansini and Benenati.¹ The patient presented the usual symptoms of Addison's disease, and on section was found to have tuberculosis of the suprarenals. Besides these typical changes there was found an enlargement of the previously shrunken thymus, an hypertrophy of the thyroid and pineal glands, and of the spleen. The authors do not consider this an accidental occurrence, but believe it to represent a form of compensation. That in many cases such an hypertrophy of the blood-forming glands does not occur may be explained, perhaps, on the ground that only in young people and very slowly progressing cases are the circumstances favorable to such a compensatory change.

These authors discuss the question of the origin and significance of the excess of pigment in Addison's disease. They believe that the pigment originates from the excessive activity of the rete Malpighii, and not from the blood. This pigment is to be looked upon, perhaps, as an inner secretion of the cells, and serves the purpose of protecting the body against the rays of light and still more against chemical rays. Possibly the excess of this secretion is to be considered as toxic, the toxic substance being absorbed by the blood and rendered inert by the adrenals. Other observations speak more for a compensatory relation between the Malpighian cells and their pigment formation and the adrenal activity. Thus, in many cases of Addison's disease meladerma does not occur, and, according to Greenhow, such show a rapidly fatal course.

Addison's Disease and Pellagra. Finotti and Tedeschi.² These authors have found almost constantly, in bodies of patients dead from pellagra, chronic inflammatory changes in the adrenals, especially at the expense of the nerve elements. They were led to make these observations because of a patient in whom the differential diagnosis between pellagra and Addison's disease seemed impossible, and in whom the section gave, besides a thinning of the intestinal walls, marked changes in the adrenals. Already Carraroli has called attention to the adrenal changes in pellagra, in which nodules were observed said to contain the specific organism of pellagra.

The treatment is unsatisfactory. Organotherapy fails in most instances, though occasional good results are reported. J. Lange³ mentions a case in which continued improvement was brought about by the administration of adrenal substance, but the bronze coloration did

¹ Policlinico, April and May, 1902.

² Riforma med., No. 96.

³ Münchener med. Wochenschrift, 1902, No. 35.

not disappear. Tuberculin injection in this instance was negative. In discussing this C. Backhaus¹ spoke of a clinically typical case in which adrenal extract gave no result. The autopsy in this patient showed the rare condition of atrophy of the suprarenal glands. Similar lack of effect from the use of suprarenal extract was noted by Alaria and Varanini.² The good results obtained by other observers these authors believe to be explainable on the ground of remissions, which are not infrequent in Addison's disease.

ACROMEGALY.

While no important contribution has been made to the subject during the past year, the cases reported of hypophysis tumor without symptoms of acromegaly are of interest in view of the different opinions held as to the nature of the disease. Such a case is reported by McFarland³ as an accidental discovery in an old woman who had long been under observation previous to death. The tumor was irregularly rounded and flat, and was larger than a silver dollar. Anteriorly it had so pressed upon the optic tracts and chiasm as to cause much atrophy. The tumor was an angiosarcoma, and had apparently replaced the hypophysis entirely. Carbone⁴ describes a similar case. An adenomatous tumor of the hypophysis 3 x 4 x 5 cm. was found in a man, aged sixty years, and absolutely no trace of acromegaly.

Corvini⁵ discusses the occurrence of exophthalmos in this disease after reporting a case in which the condition was present. In the majority of instances the eyes are described as small and covered by the lids; in a few, however, as the disease progresses exophthalmos is noted. According to Corvini, where the projection of the eyeball occurs gradually, as in his case, it is to be explained on the ground of a narrowing of the orbit due to an enlargement of the pars orbitalis of the frontal and ethmoid bones and of the lower jaw, which thus forces the eye forward. In other instances the exophthalmos occurs rapidly, and, after remaining prominent for a time, gradually diminishes to some extent, presenting a stationary stage of moderate bulging. The author thinks that these cases may be due to direct compression of the cavernous sinus by the almost constantly enlarged pituitary, or by thrombosis, thus causing a swelling in the peribulbar and retrobulbar venous system, with consequent projection of the bulb. In Corvini's case there was marked hypoplasia of the external genitals and of the uterus.

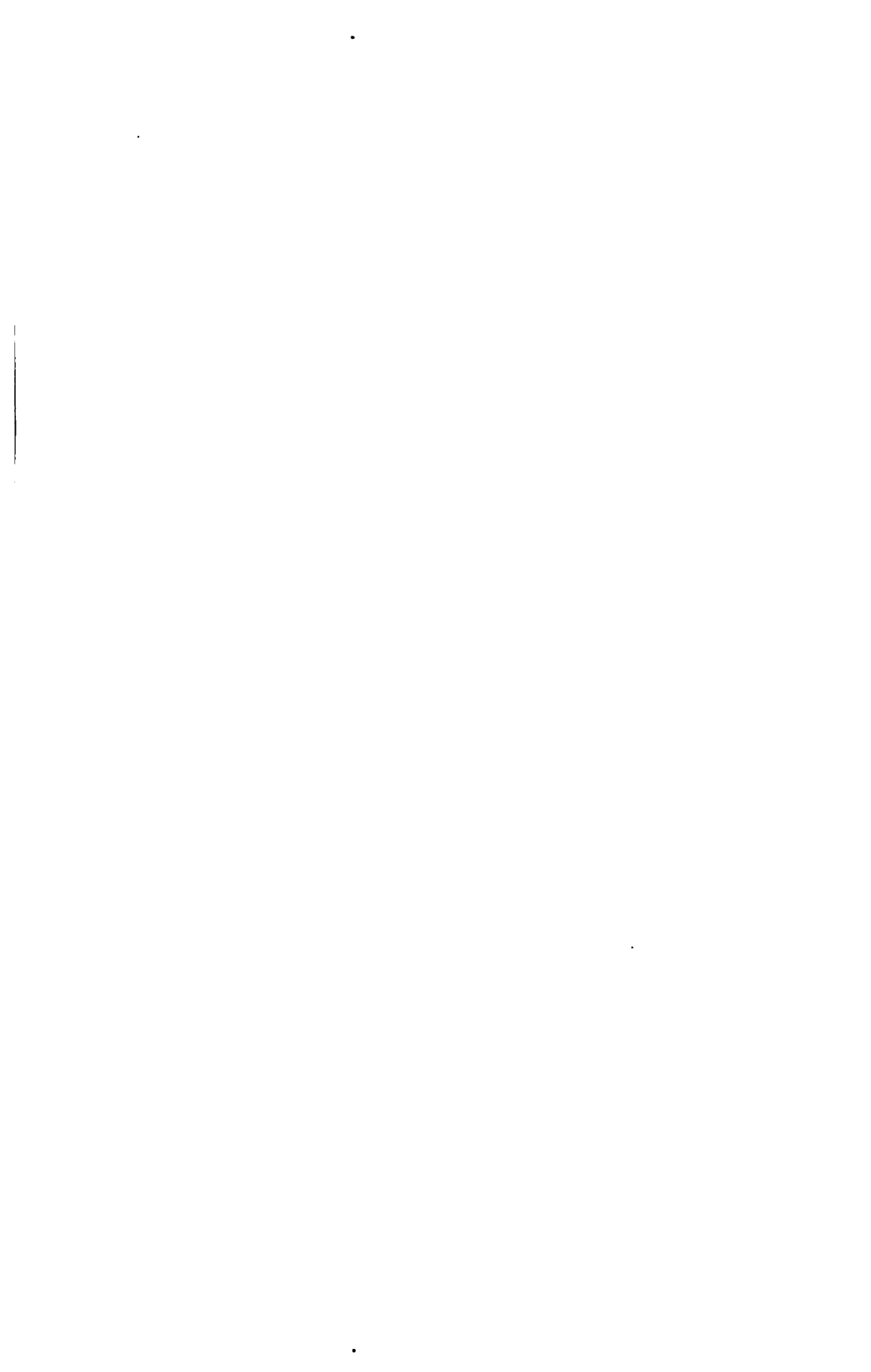
¹ Münchener med. Wochenschr., 1902, No. 35.

² Clin. med. Ital., 1902, No. 1.

³ Proceedings of the Pathological Society of Philadelphia, new series, vol. vi., No. 3.

⁴ Gazz. med. Ital., 1902, No. 18.

⁵ Morgagni, March, 1902, abstract in Centralblatt f. innere Med., No. 35.



OPHTHALMOLOGY.

By EDWARD JACKSON, M.D.

DISEASES OF THE CONJUNCTIVA.

Lymphoid Infiltration. Under the name *hyperplastic subconjunctivitis* Berry¹ has described a condition characterized by the formation, beneath the conjunctiva of the lower lid, of a firm swelling of almost the consistency of cartilage, associated with little conjunctival irritation, but sometimes with cedema, and which disappears after some months without treatment. Nettleship² reports four cases of somewhat similar character. The first of them seems to indicate that this condition and the glandular enlargements which sometimes accompany it may be of serious importance as an early sign of Hodgkin's disease. In this particular case the swelling did not disappear, but continued to increase, and involved the upper lids and the adjoining parts of the face. In the maxillary region were a number of enlarged lymphatic glands. The patient was anæmic and emaciated. Later the lymphatics of the neck also enlarged, and the disease terminated fatally. Such a condition suggests that seen in chloroma and certain cases of lymphoid growths in the orbit, such as have been reported by Dunn³ and others. That all cases of "hyperplastic conjunctivitis" are of similar character seems improbable.

In one of Nettleship's other cases the swelling first arose in connection with an attack of iritis. In this and another case the swelling was quite temporary. In his fourth case the swelling grew somewhat less, but continued quite marked at the end of a year and a half. In this patient the swelling increased during the day and diminished at night. On keeping him in bed continuously, with the eye bandaged for a week, it disappeared altogether. But when he got about again it returned, in spite of keeping the eye bandaged during the day.

In one of Nettleship's cases both eyes were affected. In another it first affected the right eye, and when the swelling had been removed from this the left became similarly affected. In the other two cases it

¹ Trans. Ophthalmol. Soc. of the United Kingdom, 1892.

² Royal London Ophthalmic Hosp. Rep., May, 1902.

³ Trans. Coll. of Physicians of Philadelphia, March, 1893.

remained confined to the right eye. Rest in bed with the compress bandage seemed to have most influence in removing this condition. In three of the cases there was disturbance of the general health, with some evidence of anæmia, and the other patient had noticed a red streak of lumps on the forehead, which lasted a fortnight upon two occasions. While Nettleship's cases were evidently of a different character, he does not make it clear just what relation they have to more common œdema of the lids. A swelling that disappears wholly in a week, or to a marked degree during one night, must be somewhat of the character of œdema.

Under the name lymphoid infiltration of the conjunctiva Valude and Morax¹ report a case in which a similar condition involved the upper as well as the lower lids of both eyes. It occurred in a man whose health was otherwise good, caused no inconvenience, and remained unchanged for the six months he was under observation. The term used by these authors seems superior to the one proposed by Berry.

A case of conjunctival lymphoma is also reported by Valude.² It was attended with enlargement of the cervical glands and degenerative change of one of the tonsils.

Bacteriology of Conjunctivitis. After reviewing the history of this subject Corsini³ reports his own observations on cases of acute catarrhal conjunctivitis. He found the Koch-Weeks bacillus in about 20 per cent. of the cases, and seems surprised that it was not more frequently encountered. In 46 per cent. he found a small bacillus which Gram's stain colored faintly, and which developed more fully on Loeffler's serum than did the Koch-Weeks bacillus. In 20 per cent. of the cases the diplobacillus of Morax-Axenfeld was found. The gonococcus was found in the case of one adult, a washerwoman, probably infected from contaminated linen. Her eye was entirely destroyed in spite of energetic treatment. The other cases were in young children, and all terminated in recovery. In one case of pseudomembranous conjunctivitis in an infant staphylococcus pyogenes was the only pathogenic bacterium found. Recovery was complete. In the only case of streptococcus conjunctivitis the lacrymal passages were healthy. The pneumococcus was found in three cases, all mild.

Corsini concludes that a microscopic examination of the secretion is useful and even indispensable to the proper classification of conjunctival inflammations. But it often needs to be supplemented by culture experiments. When studied bacteriologically, an inflammation which

¹ *Annales d'Oculistique*, March, 1902.

² *Recueil d'Ophthalmologie*, June, 1902, p. 359.

³ *Archivio di Ottalmologia*, July, 1902; *Ophthalmic Record*, October, 1902.

clinically resembles one form of conjunctivitis may be found to belong to a totally different class, representing perhaps an attenuated virus of a more grave disease. The difficulty of such examinations varies for different varieties of organisms, requiring the greatest patience for the pneumococcus and the diphtheria and pseudodiphtheria bacilli.

Influence of Toxins on the Conjunctiva. The influence of bacterial toxins in the production of inflammations of the eye is the subject of the Boylston prize essay by Randolph.¹ In a series of forty experiments he kept the conjunctiva of the rabbit continually filled with a solution of the toxin for a period of from fifteen minutes to two hours, or had this instilled every few minutes for the greater part of the day. The toxins of the gonococcus, yellow staphylococcus, diphtheria and colon bacilli, pneumococcus, white micrococcus of the skin, and xerosis bacillus were tried. In but one experiment was there any reaction produced.

These results seem directly opposed to those obtained by Morax and Elmassian,² with toxins from the gonococcus, which they found did cause hyperæmia, cedema, and discharge from the conjunctiva, that ceased a few hours after the instillations were suspended. But they pointed out that to obtain an active toxin the cultures must be made from cases of purulent ophthalmia running a malignant course; that less virulent cultures did not produce the same result, and, also, that the conjunctiva of the rabbit was less sensitive to this irritant than that of man. The one experiment in which Randolph did obtain a positive result from the instillations was with the gonococcus toxin. When we remember the above caution and the contradictory results regarding the existence and virulence of the gonococcus toxin that have been obtained by different observers, it seems quite possible that Randolph's results can be harmonized with those of the earlier experimenters. His explanation of a possible break in the conjunctiva in this one case, in which he got a result similar to theirs, is reasonable enough, but is possibly unnecessary.

In his next series of experiments Randolph injected the toxin beneath the conjunctiva. In every one of the thirty-one experiments a decided inflammatory reaction was produced. In five control experiments in which sterile bouillon was injected in one eye and one of the toxins in the other, the former caused no reaction except in one case in which the conjunctiva was accidentally torn. In a third series of six experiments the filtrate containing the toxin was injected into the anterior chamber, and in every case caused a decided inflammation involving the iris.

¹ American Journal of the Medical Sciences, November, 1902.

² PROGRESSIVE MEDICINE, June, 1900.

Randolph's conclusions are :

1. Bacterial toxins, so far as tested, when instilled even for many hours into the healthy conjunctival sac, were found incapable of producing inflammation or causing other injury. The one exceptional result has already been discussed.

2. The same toxins, when injected into the tissue of the conjunctiva or into the anterior chamber, invariably set up local inflammation, the extent and intensity of the inflammation varying to some degree, according to the species of bacterium yielding the toxin.

3. Bacteria which had not previously been proven to produce soluble toxins were found to produce them even in young cultures. And it is suggested that injections of bacterial filtrates into the eye, particularly into the conjunctival tissue, constitute a more delicate biological test for the detection of certain toxins than the tests usually employed for this purpose.

Trachoma. The bacteriology of trachoma still baffles investigators. Morax¹ has studied eighteen cases by microscopic examinations of the secretions and granulation tissue with culture experiments. His results are entirely negative. The only "positive" deduction he makes is that the micro-organisms to which Sattler, Michel, Müller, and others have attributed an etiological rôle are not the cause of this disease.

In spite of these negative results in the domain of bacteriology, the positive evidence which continues to accumulate from practical experience with the disease constitutes an overwhelming demonstration of its contagious character. This disease has in ophthalmology a practical importance that can only be compared to that of tuberculosis in general medicine. The dangers of its contagion and the measures by which the further spread of the disease can be wholly prevented cannot be too often emphasized.

In 1886 the work of a committee of the New York Academy of Medicine, headed by R. H. Derby, called attention to the prevalence of trachoma in the orphan asylums, homes, and similar institutions in that city. The work of the committee in co-operation with the health authorities secured the passage of a law requiring special precautions to prevent the spread of this disease. Within the past year Dr. Derby² has reported upon some of the results obtained through the observance of these precautions.

The force of the lesson taught is best brought out by placing in parallel columns the percentages of ophthalmia in some of these institutions in 1886 and 1902, thus :

¹ *Annales d'Oculistique*, July, 1902.

² *Medical Record*, July 5, 1902.

	1886.	1902.
New York Juvenile Asylum	17.7	2.5
Five Points House of Industry	66.5	4.4
House of Our Lady of the Rosary	18.3	1.6
House of Refuge	16.2	7.0
Catholic Protectory	40.0	3.7
St. Joseph's Asylum	58.3	1.2

The way in which these results have been attained is indicated by the report regarding one of the above institutions. The children on admission are examined, and those showing any evidence of contagious eye disease are immediately isolated in a building constructed for that purpose. Here they are kept until entirely cured. (See the plan described last year.¹) Then throughout the institution each child has its individual towel and its own jet of water, no basins or bath-tubs being used. The linens and towels of the contagious pavilion are disinfected and washed separately. Each month the eyelids of each inmate are everted and examined, as required by law.

Why this disease is not completely eradicated from these institutions is explained by the constant influx of new cases. The statistics show that of those seeking admission 19 per cent. have trachoma. This fact being brought to the attention of the New York Board of Health, they investigated the prevalence of the disease in two public schools. In one the percentage of communicable eye disease was 19.2, in the other it was 15.5. The revelation of this state of affairs was confirmed by a wider investigation. Among 57,450 children, 6690 had some contagious eye disease, and 2326 of them had trachoma.² This aroused the authorities to action. Plans were adopted for the inspection of the eyes of all the children of the public schools, and the requiring that all cases of conjunctivitis so found be subjected to treatment. The rush of cases thus brought to seek treatment nearly swamped the eye clinics of the city, and new dispensaries were established for the special treatment of this disease.

There can be no doubt that this crusade will result in immense benefit to the children in New York City, and indirectly, by force of example, to children in other parts of the country. As shown by Wilder,³ trachoma is quite as prevalent in some parts of the isolated country districts as in the crowded cities; and, as Mayweg⁴ points out, the remoteness and indifference of the country people interfere with its treatment. But to achieve success the warfare against trachoma must be sustained along the whole line. Every patient (as with tubercu-

¹ PROGRESSIVE MEDICINE, June, 1901, p. 386.

² New York Medical Journal, February 7, 1903, p. 243.

³ PROGRESSIVE MEDICINE, June, 1902, p. 357.

⁴ Klinische Monatsbl. f. Augenheilk., July, 1902, p. 70.

losis) must be taught the need of certain precautions, especially isolation as to bathing arrangements, and local applications to the diseased conjunctiva, to prevent his spreading the contagion.

In addition to the cases that arise among the ignorant and careless within their borders the seaboard cities have to contend against the disease imported with immigrants. Indeed, this sort of danger menaces every community, for trachoma is so chronic and so insidious that it can easily be carried anywhere. In spite of all that has been written, the importance of regarding it as a disease highly contagious when untreated, but which can be rendered innocuous by proper supervision and treatment, is still imperfectly appreciated.

The benefits of proper supervision in the New York asylums are by no means exceptional. In Amsterdam, Holland, Jitta¹ reports similar reductions in the number of cases. In a school that in 1880 showed 53 per cent. of trachoma it had been reduced in 1901 to 8.6. In other schools showing a percentage of 35.5 in 1880 it was reduced to 7.8 in 1901. Standish² points out that while trachoma formerly brought 20 to 25 per cent. of out-patients to the Massachusetts Eye and Ear Infirmary, the proportion is now reduced to 3.5 per cent. This reduction he ascribes to the exclusion of trachomatous immigrants.

Without knowing anything of the microbe that causes it, we do know these things about the disease: 1. Trachoma untreated is highly contagious. 2. Local treatment renders it practically non-contagious. 3. The observance of certain reasonable precautions will practically eradicate the disease. One obstacle to such eradication has been uncertainty as to its diagnosis. Standish says those who doubt its contagiousness confuse it with follicular conjunctivitis. Morax³ points out that the diagnosis may be obscured by a false conception of the anatomical lesions and also through intercurrent acute inflammations. In a controversy with Wecker⁴ regarding its frequency, he holds that the diagnosis may be based on the family history of other cases, in connection with the local lesions, and that we should not exclude cases because they end in spontaneous cure. However difficult it may be in some cases to distinguish trachoma from other conditions, the existence of the specific contagious disease is certain, and where it cannot be excluded treatment can be employed which will be appropriate for trachoma and yet not inappropriate for the conditions that may be confused with it.

¹ *Annals of Ophthalmology*, July, 1902, p. 570.

² *Boston Medical and Surgical Journal*, October 2, 1902.

³ *Annales d'Oculistique*, March, 1902.

⁴ *Ibid.*, July, 1902.

TREATMENT. As a substitute for copper sulphate, Arlt¹ recommends *copper citrate*. It occurs as a green, light powder, containing 35 per cent. of copper. He uses it in a 5 or 10 per cent. ointment. This is placed in the conjunctiva three times a day by means of a glass rod. The lids are then closed and massage used to diffuse it. It usually causes but slight smarting, and the patient can make the application himself. In a few cases it is not well borne, even in the 5 per cent. ointment.

The use of *jequiritol* is favorably reported by Malakow² and Hummelsheim.³ They report the same benefits from its use as follows from the use of jequirity. But Malakow points out that on account of the extreme pain and reaction that it produces it will not be used often.

The value of *ichthyol* in the treatment of trachoma is well established. As a method of employing it Popov⁴ has used the 10 or 20 per cent. watery solution, which he allows to fall, drop by drop, on the everted lids. In one case he encountered a decided idiosyncrasy toward it, the application causing conjunctival oedema.

The subconjunctival injection of a 5 per cent. watery solution of *carbolic acid* has been employed by Niemtchenkov.⁵ The injection is made immediately beneath the conjunctiva. A few drops (not enough to cause tension at any one place) are injected. He begins with a single injection at the point most affected, and does not repeat it in less than five days, preferring to allow a two weeks' interval. He reports remarkably good results. Some cases were cured by a single treatment, others by a second, and only a few required a third injection.

The application of the *X-rays* to the treatment of trachoma is reported by Mayon.⁶ Exposures were made of three minutes' duration, the tube being placed nine inches from the eye and a 4 ampère current used. For the exposure the lids were everted and the lower pushed up so as to cover the cornea. The case was a severe one, but after twenty-two exposures in about seven weeks the patient was discharged, cured. Some dropping of the lashes and conjunctivitis occurred before the treatment was discontinued.

Ophthalmia Neonatorum.⁷ The value of the Crédé method for preventing this disease is universally admitted to be very great. Its routine employment, however, has been contested on the ground that it

¹ Centralblatt f. prak. Augenheilkunde, March, 1902, p. 80.

² La Clin. Ophthalmologique, August 25, 1902.

³ Zeitschrift f. Augenheilk., April, 1902.

⁴ La Clin. Ophthalmologique, April 10, 1902, p. 111.

⁵ La Semaine Médicale, May 28, 1902.

⁶ Trans. Ophthalmol. Soc. of the United Kingdom, June 12, 1902.

⁷ PROGRESSIVE MEDICINE, March, 1902, p. 214.

is not entirely free from danger of producing inflammation of the conjunctiva, and that in many cases it produced an undesirable degree of irritation. It has found an earnest advocate in Leopold,¹ who, in an experience of about 30,000 cases in the Dresden Obstetric Clinic, claims that he has never seen any serious harm from it. He admits that it does occasionally cause slight irritation of the eye for the first day or two, especially in infants prematurely born. This is shown by a slight congestion of the lids and a trace of discharge. But such symptoms occur rarely, and usually disappear in a few hours.

He is inclined to ascribe the unfavorable results noted by others to failure to follow accurately Cr  d  's directions, and urges that they ought to be carried out exactly. Immediately after the infant has been bathed the lids should be gently separated with two fingers of the left hand, and a single drop of the 2 per cent. solution of silver nitrate, hanging from the end of a glass rod, brought in contact with the cornea. The lids are then allowed to close, and nothing more is to be done. Leopold believes that subsequent manipulation of the lids, with the idea that it will render the application more effective, is to blame for the excessive irritation that others report.

As to the efficiency of the method, Leopold² reports the experiences of one year, including 2146 infants. There were three cases of blennorrh  a. In one case it was proven that the method had not been carefully employed on account of the hurry incident to an overcrowded ward. The other two cases occurred immediately after new assistants and nurses went on duty, who had not yet been thoroughly drilled in the method. In this series of cases it was proven by microscopic examination that 98, and the clinical evidence indicated 200, of the mothers had gonorrh  a.

Leopold finds, however, that a weaker solution of silver nitrate than 2 per cent. if carefully used in the same way, will be equally effective, and will avoid the symptoms of irritation. From April to July, 1902, he employed a 1 per cent. solution of silver nitrate in the eyes of 698 infants. No early infection was observed, and but one late infection. The application caused no irritation. He has also employed in 172 cases a solution of silver acetate which reaches saturation at 1.25 per cent. Ten cases showed slight irritation in the first twenty-four hours, but there were no infections.

Runge³ is also an earnest advocate of the Cr  d   method. He reports 1000 cases in which it was used without any case of severe infection. He points out that to be effective the instillation must be made soon

¹ Berliner klin. Wochenschrift, August 18, 1902.

² Ibid., May 19, 1902.

³ Ibid.

after birth. It should never be later than one hour. After that it is likely to fail to prevent the development of ophthalmia.

Wilson¹ prefers to rely upon a different line of prophylaxis, including the antepartum care of the birth-canal, thorough cleansing of the lids after expulsion of the head, and non-invasion of the conjunctiva by separation of the lids until there is the appearance of a typical discharge.

It may well be questioned whether a part of the good results ascribed to the Cr  d   method may not be due to some of the other precautions which now form a part of antiseptic midwifery and upon which Dr. Wilson relies. Thus, among 4956 deliveries in two Philadelphia lying-in hospitals (the Cr  d   method having been used for 802 cases only), I found² that there had been but six cases of ophthalmia, and the sight of only one eye had been damaged.

This fact stands out clearly: *ophthalmia neonatorum* is almost wholly preventable. The existence of more than one method of preventing it does not lessen the practitioner's responsibility to prevent it by some effective method. On the whole, the method of best established efficiency is still the Cr  d   method. *Protargol* has been used instead of silver nitrate for the prevention of this disease, and excellent results have been reported from this use of it. But the statistics are not yet extensive enough, nor is the manner of using it fixed with sufficient definiteness to make it a rival of the Cr  d   method. It is still a proper and promising experiment to be tried and carefully observed, but not yet a plan to be absolutely relied upon.

For the *treatment* of *ophthalmia neonatorum* the literature of the past year shows a slight reaction toward silver nitrate, but a very slight one. The mere passing of intemperate enthusiasm or the results of inefficient methods of using a new drug fully account for the disposition of a few to return partly to the use of the older method. *Protargol* must not be used like the nitrate, but in its own way. In the Massachusetts Charitable Eye and Ear Infirmary there has been under treatment with silver nitrate 6 per cent. of unsuccessful cases. *Protargol* at first was used in 4 per cent. solution, and gave about the same results. But the strength of the solution was increased until in the last fifty cases, for which the 20 per cent. solution was employed, Standish³ reports that no baby which had a clear cornea upon admission has had any corneal complications.

In these cases, too, the duration of treatment was shortened, from an average of twenty-three and one-half days that it had been under silver nitrate, to sixteen and one-half days. A similar shortening of the

¹ Philadelphia Medical Journal, April 12, 1902.

² Transactions American Ophthalmological Society, 1898.

³ Boston Medical and Surgical Journal, October 2, 1902.

period of cure has been reported by others.¹ It should be noted, however, that the application of the silver salt to the conjunctiva was only one part of the treatment that gave such good results. All these cases were treated in a hospital where it was known that directions for cleanliness in the care of the eyes were scrupulously followed.

Diphtheritic Conjunctivitis. Diphtheria of the conjunctiva has been difficult to define; and there is still considerable uncertainty as to what cases should be classed under this head. The former distinction between diphtheritic and croupous conjunctivitis must be abandoned. Probably many cases that never present the enormous infiltration of the lids, formerly supposed to characterize diphtheria, are really diphtheritic; while some which present that symptom in high degree, with more or less pseudomembrane on the conjunctiva, are of entirely different origin.

Roscher² reports five cases presenting most of the clinical features of diphtheria, two of them resulting in great impairment of vision from corneal involvement, in none of which was the Klebs-Loeffler bacillus discovered by microscopic examination or culture methods. In one case the gonococcus was found, in one the pneumococcus, and in the other three, which all ended in recovery, the xerosis bacillus. Jessop³ reports thirteen cases of membranous conjunctivitis. In only eight of them was the Klebs-Loeffler bacillus found; the others appeared to be due to streptococci or staphylococci.

The clinical picture that should arouse suspicion of diphtheria is thus given by Standish.⁴ The case begins for three or four days with velvety congestion of the palpebral conjunctiva, lacrymation, and slight, if any, mucous discharge. The conjunctiva and lids become gradually infiltrated; the upper lid overhangs the lower; and a definite, tough, dirty white, closely adherent membrane appears first on the tarsal surface of the upper lid. The membrane is separated with difficulty, and leaves a bleeding surface. There is then slight mucopurulent discharge, which subsequently increases.

To these local symptoms must be added evidences of general illness. Of Jessop's eight cases, seven showed albumin in the urine. Standish's paper is based on thirty-five cases. In most of them the conjunctival disease was incidental to faucial diphtheria. Stevenson⁵ saw the association with diphtheria of the nose or fauces in four cases.

However, in the present state of our knowledge the only thing that

¹ PROGRESSIVE MEDICINE, June, 1901, p. 383.

² Klin. Monatsblätter f. Augenheilkunde, July, 1902.

³ Ophthalmic Review, April, 1902, p. 111.

⁴ Boston Medical and Surgical Journal, October 2, 1902.

⁵ Trans. Ophthal. Soc. of United Kingdom, March 14, 1902.

justifies the scientific classification of such a case as one of diphtheria of the conjunctiva is the finding and certain identification of the Klebs-Loeffler bacillus. The identification cannot be complete by mere microscopic examination; culture and inoculation experiments must be added.¹ This is the weak point in Stevenson's report. He includes forty-three cases. But as he seems to have depended upon smear cover-glass preparations, there must remain some question as to how many of these were cases of true conjunctival diphtheria.

TREATMENT AND PROGNOSIS. The essential thing in treatment is to give antitoxin; and if the case seems suspicious and urgent one should not delay for a complete scientific diagnosis. Diphtheritic conjunctivitis was formerly almost invariably fatal to sight. Its treatment by antitoxin has completely changed this. Of the thirty-five cases given by Standish, but four suffered serious impairment of vision. In three of these the diphtheria arose as a complication of measles; and the lesions of the cornea produced absolute blindness in both eyes. In the other case one cornea was very badly involved when the patient was first seen. Nevertheless, this patient in the end retained considerable vision. The eye was lost in one of Jessop's eight cases, and one of Stevenson's patients died. But in all the other cases referred to, eighty-two out of eighty-eight, the disease terminated in recovery, with good vision.

The doses of antitoxin employed in the cases reported last year varied widely. Desvaux,² in a case complicated by bronchopneumonia, employed 5 cubic centimetres of Roux's serum, and repeated the dose once. Stevenson used from 1000 to 4000 units. L. E. Holt³ used 2400 units for a child six months old. Standish reports the general use of 4000 units at the first dose, repeated if necessary at the end of six or eight hours. The largest amount used in any one of his cases was 44,000 units, given to a child two years old.

DISEASES OF THE CORNEA.

Suppurating Ulcer. I prefer to use this term because many ulcers show a tendency to extend, through destruction of the corneal tissue, that are not of the class originally designated as serpiginous, and the latter term is too often used incorrectly to designate them. Kipp⁴ probably uses serpiginous in this loose way in pointing out that cases

¹ *PROGRESSIVE MEDICINE*, June, 1899, p. 370; and June, 1900, p. 324.

² *La Clinique Ophtalmologique*, August 25, 1902.

³ *Medical Record*, May 31, 1902.

⁴ *Journal of the American Medical Association*, August 9, 1902.

presenting the following appearances never extend, but heal under very simple treatment. "From the margin of the ulcer straight or nearly straight lines, broadest at the ulcer and gradually tapering, diverge in all directions somewhat obliquely through the parenchyma of the deepest layer. They never give off branches. The further ends of these diverging lines are connected by grayish intermediate striæ, of the same width throughout, and running at right angles to them. If present all around, these intermediate linear opacities form a complete ring of the same form as the margin of the ulcer, but situated more deeply and 3 or 4 mm. from it. Sometimes a smaller ring is seen between the outer ring and the margin of the ulcer. The cornea between the linear opacities here described is cloudy, but that outside of the outer ring is usually of normal transparency."

Kipp believes that these features indicate that the ulcer has ceased to be progressive, and that for such ulcers treatment which requires further destruction of tissue or risk of anterior synechiæ should be dispensed with. Atropine, boric acid fomentations, and, later, massage with yellow oxide of mercury ointment, constitute the appropriate treatment. Since hearing Kipp's paper I have seen two ulcers presenting the appearances he described, and their course justified his prognosis.

Where the ulcer does not present the above appearance more active treatment is required. Kipp has given up the Saemisch incision, and relies upon the use of the galvanocautery. First ascertaining the extent of the ulcer by the use of fluorescein, he thoroughly destroys its whole surface. If there be increased tension of the eyeball, or severe iridocyclitis, the cautery is made to perforate the cornea. When the progress of the ulcer could not be thus arrested, Kipp has found that the patient suffered from diabetes or nephritis.

In discussing Kipp's paper, de Schweinitz stated that he made his treatment correspond to the results of bacteriological investigation. If the pneumococcus is present (the true serpent ulcer) he always uses the galvanocautery. In the absence of virulent infection he relies on scraping and applications to the surface of the ulcer of tincture of iodine and carbolic acid.

The tendency of the Saemisch incision, across the centre of the ulcer, to be followed by anterior synechiæ and subsequent increased tension, has led Zirm¹ to give it up. He finds that a small incision at the lower periphery of the cornea is equally efficient, and is free from the risks that attend the other operation. The equal efficiency and greater safety of the peripheral incision I have appreciated and taught for many years. But, as it is made through sound tissue, it is more liable to

¹ Centralblatt f. prakt. Augenheilkunde, March, 1902.

close sooner than the incision made through the ulcer. On this account it is generally necessary to reopen the incision with a probe every twelve or twenty-four hours until healing is well started.

Subconjunctival injections have been used by many surgeons for the treatment of these ulcers. They are esteemed of very high value by Dunn.¹ He finds that the fluid so injected disappears quite slowly, and for several days furnishes an antiseptic to the corneal substance, and at the same time it tends to render and keep sterile the conjunctival sac. The efficiency of such injections depends largely upon the freedom of the corneo-conjunctival circulation. He has employed two solutions—the cyanide of mercury, 1:3000, and the following, to which he gives the preference:

Metallic iodine	1 grain.
Potassium iodide	75 grains.
Distilled water	5 fluidounces.

This solution is injected with an ordinary hypodermic syringe. After the use of a local anæsthetic the conjunctiva is raised with the forceps about 1 mm. back from the corneal margin opposite the ulcer, and ten or twelve drops of the solution are injected without removing the point. Dunn has noted more or less inflammatory adhesion of the conjunctiva and subconjunctival tissues as a result of the injection, which remains visible a long time afterward, but no harm has been seen to result from it.

Lezenius² reports that subconjunctival injections of sodium cinnamate (hetol) are beneficial. He has used a 1 to 5 per cent. solution in water or physiological salt solution. The solution should be clear and of a weak alkaline reaction.

Vieusse³ has practised subconjunctival injections of sublimate solution, but has noticed no decided benefit from them, and finds that patients often refuse the second injection on account of pain. He uses the cautery and attaches much importance to applications of iodoform, either in impalpable powder or as an ointment. These are also recommended by Kipp and de Schweinitz.

Carbolic acid has been widely used as an application to these ulcers. Theobald,⁴ who has had great success with it, and believes that it may be used with advantage in many cases in which it is usual to employ the cautery, gives the following method for using it: A very small quantity of absorbent cotton is wound on the tip of a pointed toothpick. This is dipped in the pure carbolic acid and applied to the

¹ Archives of Ophthalmology, May, 1902.

² Klin. Monatsbl. f. Augenheilkunde, October, 1902.

³ Recueil d'Ophthalmologie, March, 1902.

⁴ American Journal of the Medical Sciences, June, 1902.

surface of the ulcer, with a gentle rubbing movement, which is in effect a sort of curettage. If the ulcer be very foul the necrotic material should first be removed with a curette. The acid is allowed to remain in contact with the tissue for a few moments while the lids are held apart. Then the eye is flushed with sterile water, salt solution, or boric acid solution. Such an application is not to be a part of the routine treatment of corneal ulcers. Theobald finds its good effects are manifested in the dangerous ulcers commonly due to pneumococcus, and less frequently to the more virulent streptococcus. In discussing Kipp's paper the value of carbolic acid was emphasized by Haab.

The treatment of these ulcers, advised by Panas,¹ includes the cleansing with mercuric solutions, 1:20,000 of the biniodide, 1:10,000 of the bichloride, or 1:5000 of the cyanide. After cleansing with one of these, three or four drops of a solution of methylene-blue, 1:500, is instilled, followed by the application of a 6 per cent. ointment of iodoform. In the more severe cases he, too, rejects the Saemisch incision, and prefers the use of the cautery, opening the anterior chamber with it to allow the escape of hypopyon.

Baudry² advises a very similar line of treatment, except that he adds subconjunctival injections of cyanide of mercury, and uses tincture of iodine instead of methylene blue.

Tincture of iodine has been recommended by others. De Schweinitz, Risley, Wilder, Hiers, and Greenwood, in discussing Kipp's paper,³ all spoke favorably of its influence. But Friedenwald, who thought it invaluable in dendritic and other superficial ulcers, had entirely abandoned its use for infected ulcers. He suspected the difference of opinion on this point was due to the use of "serpiginous ulcer" to cover different diseases. It is noticeable that Hiers,⁴ in advocating elsewhere the use of iodine in the treatment of corneal ulcers, reports two cases to illustrate its effects, both of which were totally different from the suppurating ulcers here under discussion. In my own experience tincture of iodine has been of value (although inferior to diluted nitric acid) in the treatment of the true serpiginous ulcer, which tends to creep over the surface without much tendency to perforate. But in other infected ulcers marked by the freer formation of pus and a greater tendency to perforate iodine has been useless.

On account of the pain caused by tincture of iodine, Duane⁵ has used a 5 or 10 per cent. solution of iodine in vasogen. This he found caused

¹ Archives d'Ophtalmologie, June, 1902.

² Le Nord Medicafe, May, 1902.

³ Trans. Section on Ophthalmology, American Medical Association, 1902, p. 41.

⁴ Philadelphia Medical Journal, November 29, 1902.

⁵ Archives of Ophthalmology, September, 1902.

in most cases only moderate pain, lasting not more than a few minutes, but in a few cases the pain was more severe and of longer duration. His cases seem to have been of various kinds, but he reports one of suppurating ulcer in which the benefit seemed very decided. The drug was applied on a cotton-tipped probe after wiping away the tears which tend to diffuse it over the conjunctiva.

SERUM THERAPY. The demonstration that true serpiginous ulcer of the cornea is due to the pneumococcus has turned the attention of investigators to the question of a serum therapy. Gatti,¹ experimenting with rabbits, finds that infection of the cornea by cultures of the pneumococcus, if superficial, produces only a local reaction, but if deep may cause inflammation of the interior of the eye and the death of the animal. Inoculation of the anterior chamber always produced these fatal results, and this occurred after treatment with antipneumococcic serum and even when such serum had been introduced into the anterior chamber. He concludes that the anterior chamber of the eye of the rabbit does not share in a general immunization against the pneumococcus.

Römer,² who undertakes to furnish an experimental groundwork for clinical researches into this subject, used mice and dogs. He has also in eight cases of pneumococcus ulcer employed an immunizing serum on man by subconjunctival and subcutaneous injections. The apparent results of this treatment are not very decided. But he expresses the hope that the use of such a serum will help to prevent the development of the ulcer after such injuries to the cornea as commonly give rise to them. Axenfeld³ expresses the belief that the use of such a serum gradually closes the channels of infection, so that the ulcer stops spreading and goes on to healing.

The antistreptococcus serum of Marmorek has been employed by Attanasio.⁴ He obtained no marked results in five cases of hypopyon keratitis, but he believes it had great value in preventing postoperative infection.

GENERAL TREATMENT. Burnham,⁵ in a comparatively chronic type of corneal ulcer with hypopyon and involvement of the iris and ciliary body, has depended chiefly upon the internal administration of mercury and potassium iodide, with pilocarpine given hypodermically. Locally he used atropine and hot stupes with boric acid solution. He claims that this plan secures rapid relief from pain, with subsequent

¹ *Annali di Ottalmologia*, 1902, pp. 3 and 27.

² *Graefes Archiv f. Ophthalmologie*, Bd. liv., Ht. 1.

³ *Münchener med. Wochenschrift*, August 19, 1902.

⁴ *Archivio di Ottalmologia*, June, 1902.

⁵ *Lancet*, December 6, 1902.

removal of the corneal opacity. (See the treatment of infected wounds on a subsequent page.)

Gonococcus Ulcer. Parker¹ advocates the Saemisch incision in the treatment of these ulcers, and reports twelve cases thus treated, in eleven of which useful vision was retained, only one eye being lost. These results he contrasts with those obtained without operation, which were almost invariably total loss of vision and anterior staphyloma. In this disease, as Parker points out, in most cases ulceration starts near the periphery of the cornea. For such ulcers the Saemisch incision is practically a peripheral incision, such as has been recommended above. Indeed, on looking over Parker's cases I find but two of them in which the incision was not peripheral, and one of these the case in which the eye had to be subsequently enucleated. In two cases where the ulcer was not near the periphery of the cornea, the operation done was not that of Saemisch, but a paracentesis near the corneal limbus. I notice, too, that in these cases when there was no prolapse of the iris to keep up drainage from the anterior chamber the incision was from time to time reopened with the probe until healing was fairly established.

Marginal Ulcer. A study of primary marginal ulcer of the cornea has been made by zur Nedden.² He gives in tabular form the leading facts regarding thirty-three cases, with sketches showing the exact location of the ulcers on the cornea. The ulcers start by the breaking down of small, round spots of infiltration. They are purulent and may develop hypopyon, and there is a tendency to severe involvement of the conjunctiva. He finds in these ulcers an almost straight bacillus, with rounded ends, each rod about one and one-half times as long as it is broad, which does not stain by the Gram method, but does with other bacterial stains. This bacillus he has not been able to find except in such ulcers, and regards it as the cause of the lesion. Inoculations of this bacillus upon the cornea of the rabbit caused keratitis, the severity of which was proportioned to the virulence of the culture employed.

Corneal Epithelium in Repair of Ulcers. In his Bowman lecture Fuchs³ called attention to the rapid proliferation of the corneal epithelium after certain injuries or ulceration of the cornea. It has long been known that one of the first evidences of the healing of a corneal ulcer was the coating of the ulcer with epithelium, giving it a smooth reflecting surface long before the loss of tissue had been made good. Fuchs points out that this growth of the epithelium has an important influence in tending to level up all irregularities, the layer becoming thicker

¹ Ophthalmic Record, April, 1902.

² Graefes Archiv f. Ophthalmologie, Bd. lvi., Ht. 1.

³ Trans. Ophthal. Soc. of the United Kingdom, June 13, 1902.

where there has been any loss of substance, and thinner over any protrusion of the deeper tissue. After wounds penetrating the anterior chamber it may cover the lips of the wound so as to prevent their union, or the growth may even enter the anterior chamber and line it with what practically becomes a cyst. This vital energy of the epithelium is greater near the periphery of the cornea. Hence ulcers extend toward the centre rather than toward the periphery. Impairment of this vital energy menaces the safety of the eye. On account of the risk of such impairment, Fuchs never trusts his patients with any preparation of cocaine, especially when suffering from corneal inflammation.

Kerato-iritis from Podophyllin. Rocca-Serra¹ describes at length a form of ocular inflammation and reports five cases of it occurring among those who have to work with podophyllin. It affects most severely the cornea and iris, but the whole anterior segment of the eyeball becomes involved, and there may be swelling of the lids, with a papular eruption on the skin surface. The cornea becomes clouded, especially toward the centre, where superficial ulceration may occur. The iris becomes inflamed, with exudate in the pupil and upon Descemet's membrane. The treatment consists in the instillation of atropine and the use of hot compresses. Under these improvement is rapid.

Keratitis from Ergot. Having previously observed an epidemic of keratitis in the lower animals due to food containing a large amount of ergot, Hennicke² now reports a case of marked clouding of the cornea and pericorneal redness in a woman who had been taking large doses of ergot for ten days on account of metrorrhagia. The ergot was stopped and warm applications made to the eye, and the cornea cleared up entirely. At her next menstrual period ergot was again administered. Again the cornea became cloudy, but returned to normal when the drug was again stopped.

Corneal Opacities. **ARCUS SENILIS.** The nature of this common senile change, the character of the material which gives rise to such an opacity, and the significance of its occurrence have been the subject of many careful investigations. Within the last three years we have been told by very high authority that arcus senilis was due to hyaline degeneration (Fuchs); that it was due to hyaline degeneration with the deposit of calcareous material (Leber), and, again (Takayasu), from Professor Greeff's laboratory, that the old view that it is a fatty degeneration is the correct one.

J. H. Parsons³ has tried to determine which of these is really the

¹ La Semaine Médicale, February 12, 1902.

² Wochenschr. f. Therapie u. Hygiene des Auges, May 8, 1902.

³ Royal London Ophthalmic Hospital Reports, vol. xv., part ii.

true statement. There is no question but that the opacity is caused by the deposit of minute globules in the proper corneal tissues. But the character of the substance composing these globules is still in doubt. The fact that they fail to stain with osmic acid has been held to prove that they are not fatty. Parsons, however, working with newer stains, "Sudan III" and "Scharlach R," reaches the conclusion that these globules are oily and arise from a fatty degeneration of the corneal tissue, but that this fatty material is of a composition different from that of most other animal fats, and which is yet undetermined. Whatever the exact character of the degeneration it cannot be regarded as having any general significance. It probably depends upon a strictly local condition, the senile involution of vascular loops at the corneal limbus.

USE OF THIOSINAMIN.¹ Suker² finds that this drug is of value in removing exudates or infiltrates into the corneal tissue, whether these be organized or not. He believes it has little beneficial influence upon true cicatricial tissue. In ten cases of corneal opacity it caused clearing and improved vision in six.

He finds it is best given in capsule, three grains, once or twice a day. Hypodermic injections are liable to cause abscess. It may be applied locally as a 10 per cent. ointment in conjunction with a massage. It should not be given more than five or six weeks without an intermission of a week or ten days. But in some cases it had to be continued several months before improvement was noticed. In some cases it had caused vertigo. But, starting with one-half-grain doses and gradually increasing, Suker has found no patient that could not bear three grains twice a day. In a discussion of Suker's paper the beneficial influence of the drug was confirmed by Sherman, who finds that it usually improves vision in cases of non-vascular chronic opacity.

DIONINE FOR CORNEAL OPACITIES. The powerful influence of this drug upon the blood supply and the lymph supply of the eyeball has suggested to many surgeons its use for the removal of corneal opacities. Vermes and Vajda³ have reported on a considerable series of corneal disease in which it has been employed. In the majority of cases, but not in all, it seems to cause a reduction in the opacity and an improvement of vision, especially after the earlier applications. Luniewski⁴ finds that it is indicated to bring about rapid removal of serous or plastic exudates. He considers it contraindicated in arterio-sclerosis.

¹ PROGRESSIVE MEDICINE, December, 1902, p. 395; and March, 1903, pp. 75 and 409.

² Journal of American Medical Association, August 9, 1902.

³ Annales d'Oculistique, July, 1902, pp. 67 and 75.

⁴ Wochenschrift f. Therapie u. Hygiene des Auges, March 27, 1902.

Belliarminoff¹ concludes that it may be used for parenchymatous keratitis even during the inflammatory stage. He and Vajda prefer to use it in an ointment containing 5 per cent. of dionine. Dionine is soluble in water to the extent of 14 per cent., but the solutions at first suggested, 5 or 10 per cent., are too strong for the great bulk of cases. One-half to 1 per cent. will produce some redness and œdema in most eyes, and will often prove quite as serviceable. Solutions stronger than these should be used cautiously.

PANNUS TREATED BY ELECTROLYSIS. Pannus due to trachoma may be immediately dependent upon the existing condition of the lids, in which case the treatment should be directed to the lids, and the corneal opacity and vascularity will be reduced in proportion to the improvement in the lid surface which comes in contact with it. In a few cases, however, the pannus remains after the surface of the lid has become comparatively smooth. For these cases Lor² employed electrolysis as a substitute for peritomy.

Under general anæsthesia the negative pole is applied to the corneal limbus, the positive being placed on the cheek of the same side. A weak current, two or three milliampères, is used. The pericorneal tissue is destroyed in a zone 3 or 4 mm. wide and extending opposite the whole vascular portion of the cornea, much as others have destroyed this tissue with the electrocautery.

REACTIONS OF THE PUPILS.

Examination of the Pupil. The variations in the size of the pupil under different conditions of light make some fixed plan of examination necessary if observations of any practical value are to be made. A good plan is laid down by Schirmer.³ The things to be observed are the diameter of the pupils with both eyes open; the diameter of each pupil when the other eye is shaded from light; the reaction of each pupil to light thrown upon it, and the consensual reaction—that is, the reaction when light is thrown upon the other eye.

To make these observations the patient is placed facing a window that opens to the sky and within one metre of it. His gaze is fixed on some distant object. After comparing the appearance of the two pupils and noting their size, one eye is covered with the hand, and after waiting a couple of minutes to allow the uncovered pupil to settle, its diameter is measured. The other eye is tested in the same way and its diameter noted.

¹ *La Clinique Ophtalmologique*, September, 1902, p. 263.

² *Annales d'Oculistique*, March, 1902.

³ *Deutsche medicin. Wochenschrift*, March 27, 1902.

An ingenious method of testing the consensual reaction is proposed by Dupont.¹ A tube containing a small electric lamp is placed before one eye. The other eye is directed toward some distant object, and its pupil watched while the lamp is alternately flashed and extinguished. The test is thus applied to each eye until the surgeon has satisfied himself as to the reaction.

Schirmer accepts as the physiological limits for the diameter of the pupil in a strong light not less than 2 mm. nor more than 4 mm., and in the great majority of eyes it falls between 2.5 and 3 mm. These are somewhat smaller than the diameters formerly regarded as normal. But the difference probably means merely measurements by a stronger light. And in the stronger light the size of the pupil tends to be more fixed and definite.

The tendency to oscillation after any change of the conditions affecting the size of the pupil is taken into account in Schirmer's plan by waiting before making measurements. The extent of these oscillations vary much in health, and they may become greatly exaggerated in disease. Newton² reports a case in which this "hippus" was very marked. The patient suffered from gross disease of the brain, and was blind. Dilatation appeared to be produced by the stimulus of light. On the other hand, the reaction of the pupil may become very slow. Strasburger³ reports three cases in which the reaction to light had been lost, and the contraction with accommodation was delayed. In one case it occupied four seconds, but after repeated trials it became more rapid.

The Pupil in Aortic Disease. The time-honored explanation of disturbances of the pupil in cases of aneurism of the arch of the aorta has been through irritation of or pressure upon the sympathetic. Somewhat over a year ago Babinski⁴ pointed out that this explanation did not accord with the facts, and suggested that the real connection between aortic aneurism and the pupillary symptoms lay in a common cause—syphilis—rather than in any connection through the sympathetic. In support of this Chaillous⁵ reports two cases of dilatation of the aorta with pupillary disturbance. In one case the condition of the pupil was merely part of a complete ophthalmoplegia interna. In the other case there was myosis, greater in the right eye, and loss of light reflex, the Argyll-Robertson symptom. There were also present the "lightning pains" of beginning tabes. Both patients had suffered from syphilis.

¹ *Recueil d'Ophtalmologie*, December, 1902, p. 739.

² *New York Medical Journal*, March 29, 1902.

³ *Neurologisches Centralblatt*, August 16, 1902.

⁴ *Proc. Société Médicale des Hôpitaux*, November 8, 1901.

⁵ *Annales d'Oculistique*, July, 1902.

The supposed sympathetic connection of pupil disturbances with disease of the aortic arch has caused the condition of the pupil to be habitually considered in these cases. It is probable that if the same attention to the pupil were given in all cases of syphilitic disease of the arteries similar pupillary disturbances would often be found where the arch of the aorta was not involved. Vaquez¹ reports two cases of syphilitic disease confined to the valves of the aorta. One of these patients presented myosis, the other inequality of the pupils, and both showed the Argyll-Robertson symptom. In this connection it may be well to bear in mind what was said about the pupil in syphilis last year.² The views there expressed are confirmed by Dufour,³ who finds myosis and deformity of the pupil strongly suggestive of syphilis, and has seen the Argyll-Robertson pupil only in syphilitics.

A different explanation of inequality of the pupils with aortic aneurism is propounded by Wall and Walker.⁴ They point out that there is no evidence that the affected part of the sympathetic contains pupil dilator fibres; that in different cases irritation and paralysis of the sympathetic are assumed to arise from apparently similar conditions; that in most cases there is no other evidence that the sympathetic is involved. Their explanation is that the changes in the pupil are due to alterations of blood pressure in the vessels of the iris, and they support this by the spiral structure of these vessels and the alterations in the pupil produced by changes of blood pressure brought about in other ways. This theory is ingenious, and compares well with the old one of sympathetic involvement. But inequality is not the whole of the pupillary symptoms. Their theory does not explain such symptoms as the loss of the light reflex. The exact characters of the pupillary changes when these have been closely studied give it no support against the simple explanation of a common cause offered by Babinski.

Myosis with Tuberculosis of the Apex of the Lung. The influence of the sympathetic is more reasonably invoked by Souques⁵ to explain the occurrence of myosis, narrowing of the palpebral fissure, and apparent retraction of the globe in three cases of tuberculosis involving the apex of the lung. He points out that the course of the dilator nerves from the ciliospinal centre, through the first dorsal nerve to the cervical sympathetic, lies in direct contact with the apex of the pleura, where they would be destroyed by the inflammatory changes attending tuberculosis of that region. This symptom-group I have seen apparently caused by tuberculous disease of the cervical glands.

¹ *Recueil d'Ophtalmologie*, May, 1902.

² *PROGRESSIVE MEDICINE*, June, 1902, p. 365.

³ *Gaz. Hebd. de Méd. et de Chir.*, June 19, 1902.

⁴ *Lancet*, July 12, 1902.

⁵ *Proc. Société de Médecine des Hôpitaux*, May 23, 1902.

Mydriasis from Puerperal Infection. Gonzalez¹ reports a case in which, following septicæmia due to puerperal infection, a patient whose history gave no other cause for the trouble presented a dilated, fixed pupil and complete loss of accommodation in one eye. On account of the perfection of all other ocular movements he regarded the lesion to be a neuritis of the short ciliary nerves. Under sodium iodide the case recovered in one month.

Idiosyncrasy to Mydriatics. The fact that all cycloplegics are mydriatics is often regretted. A drug that would paralyze the accommodation without affecting the pupil is greatly to be desired. In a single patient, as reported by Phillips,² this seems to have been the case with the common mydriatics. Failing to dilate the pupil of a woman, aged twenty-seven years, with homatropine and cocaine, he employed a 2 per cent. solution of atropine, which produced as little effect. The accommodation appeared to be in abeyance. In a darkened room her vision was greatly impaired and the pupils dilated, but in a strong light the pupils contracted to the size of a "pin-head." In direct sunlight she could read the finest print. The contraction of the pupils was noticed on attempting to use the ophthalmoscope, and it prevented skiascopy.

It is not very rare to have the pupils remain comparatively small under atropine. I remember one case in which they could not be dilated beyond 3 mm., but under the drug all reaction to light was lost. In a few cases I have seen slight reaction to light when the accommodation seemed to be entirely paralyzed; but the pupil, when most contracted in these cases, remained still 7 or 8 mm. in diameter. Most eyes seem to show the effect of these drugs upon the pupil before any change is perceptible in the power of accommodation. Cases like the above must be extremely rare, although in diphtheritic paralysis of accommodation the pupil is quite frequently unaffected.

DISEASES OF THE UVEAL TRACT.

Hemorrhage with Iritis. A case of hemorrhage into the anterior chamber in the course of rheumatic iritis is reported by Fage.³ The patient gave no evidence of syphilis, or of cardiac, or arterial disease. He appeared plethoric, and the blood-count showed 6,670,000 red cells, with the normal proportion of white. The iritis had been running rather a severe course for ten days, when the symptoms became more severe, with a sharp increase of pain, and blood was found to

¹ *Annales de Ophthalmologie*, June, 1902.

² *Ophthalmic Record*, January, 1903.

³ *La Clinique Ophthalmologique*, September, 1902.

occupy the lower quarter of the anterior chamber. Atropine was stopped for forty-eight hours, and cocaine used instead, for fear of increased intraocular tension. Local bleeding from the temple was resorted to and the general treatment continued. The blood rapidly disappeared, and in two weeks the patient was discharged, cured. Fage refers to two other cases, in one of which the hemorrhage was ascribed to the menopause and in the other to hæmophilia.

Gonorrhœal Iridochoroiditis. Five cases of this disease are reported by Bull,¹ who bases a strong argument, upholding the view that gonorrhœa is a constitutional disease upon the occurrence and character of this affection. It is associated with arthritis. The onset is sudden, with severe pain and rapid loss of vision. Relapses are likely to occur, but in the end recovery may be complete, the exudate being entirely removed. Relapses are liable to occur with renewed attacks of urethritis. If neglected the disease loses its peculiar character, and the usual sequelæ of plastic iritis may occur.

Treatment of Iritis. To secure dilatation of the pupil Fuchs² employs atropine vigorously rather than at short intervals. Once, or, at most, twice a day, he places a small crystal of the atropine salt in the conjunctiva, so as to get the effect of a very concentrated solution upon the cornea. Before placing the crystal in the conjunctiva cocaine is instilled to prevent burning. But Fuchs does not approve of supplying the patient with a solution of cocaine and atropine to be dropped in at short intervals.

To prevent entrance of the atropine into the lacrymal passage and poisoning by absorption, the lid is drawn away from the eye and the lacrymal sac compressed. I think the plan of pressing upon the tear passages cannot be relied on. The efficient method of preventing a solution from entering the canaliculi is by drawing upon the skin of the lids so as slightly to evert the puncta, and holding in contact with them a little absorbent cotton to take up what solution may accidentally reach them. If this is carefully done atropine can be freely placed in the conjunctiva without danger of systemic poisoning. An energetic mydriatic attack of this kind is more likely to break up adhesions and dilate the pupil than the routine use of atropine solutions by the patient or his attendants.

To relieve the *pain of iritis*, next in efficiency to the extraction of blood from the temple, ranks the application of heat. Maddox³ recommends an electric coil of very fine wire, which can be used with the ordinary incandescent lighting current, either direct or alternating.

¹ Medical Record, December 20, 1902.

² Wiener klinische Wochenschrift, September 25, 1902.

³ La Clinique Ophthalmologique, December 10, 1902, p. 352.

The heat it supplies is constant, and can be adjusted most perfectly to the needs of the case. He employs it for iritis and other ocular affections of rheumatic origin. He has also used *dionine* with very favorable results in certain cases. But he finds it extremely difficult to predict in advance the cases in which it will give relief. *Dionine* with electric heat constitute a valuable combination for the relief of pain, applicable when either myotics or mydriatics are contraindicated. Here, again, it is well to repeat the caution about the strength of solution of *dionine*. Bourdeaux¹ found that solutions of $\frac{1}{2}$ to 1 per cent. exerted a powerful analgesic effect without causing chemosis or inflammatory reaction.

The value of *salicylates* in rheumatic iritis and in many other inflammations of the uveal tract is generally recognized. Morton² has found that very large doses may prove remarkably beneficial. One patient took four sixty-grain doses of sodium salicylate at intervals of three hours, causing tinnitus and other symptoms, but not enough to be alarming. He advises in severe cases the use of forty-grain doses every two or three hours, or even the administration of sixty grains, followed by smaller doses. Under this treatment the patient must be carefully watched for unfavorable symptoms, and before beginning with such a large dose it may be well to test any possible idiosyncrasy by giving a few smaller doses.

Aspirin (acetyl-salicylic acid) has proved an efficient substitute for the older salicylates in the treatment of iritis. Camera³ has usually given it in one-half gramme tablets (seven and one-half grains) every four hours. Kirchner⁴ has commonly administered a dose of fifteen grains, but never more than thirty grains. The indications for the use of aspirin are practically the same as for the use of the salicylates.

Tuberculosis of the Iris. Although there is nothing to support the claim of Michel that tuberculous iritis is as common as syphilitic iritis, it is likely that many cases pass unrecognized. In this part of the body as in others, we have two widely different forms of tuberculosis—one marked by the development of a single large mass, the so-called granuloma, and the other a miliary tuberculosis, with very small, gray, yellowish, or reddish specks in the iris. To these Michel added a variety of miliary tuberculosis, in which the tubercles were so small or so deeply embedded in the iris as not to be visible to the naked eye. It was upon this form that he based his view of the frequency of the disease. Generally, cases of this sort have been looked upon with doubt.

¹ *Annales d'Oculistique*, October, 1902, p. 302.

² *Ophthalmic Record*, January, 1903, p. 10.

³ *Clinica Oculista*, March, 1902.

⁴ *Annals of Ophthalmology*, April, 1902, p. 303.

Friedenwald¹ reports a case in which the ordinary form of miliary tuberculosis affected one eye, while the other presented a similar inflammation without visible tubercles. In this case and another which he reports the tubercles were distinctly grayish and pearl-like in appearance. There were also deposits on the inner surface of the cornea, differing from those seen in ordinary plastic or serous iritis. A few of these were white, sharply circumscribed, irregular in form, and large—1 mm. or more in diameter. These had the same appearance as the tubercles in the iris, and were probably of similar character. In both these cases the general condition of the patient indicated tuberculosis, and treatment was directed to it. The ocular disease appeared to be thus arrested, and the general condition of the patients was greatly improved; but vision was permanently impaired, and the iris left in much the same condition as by any severe plastic iritis.

The disease often results more disastrously. Fromaget² reports a case in which iridectomy was done on account of ciliary staphyloma. But subsequently it was necessary to eviscerate the eyeball. In a case going from bad to worse, in a child otherwise healthy, Posey³ advised enucleation.

In contrast with this are the results in two cases reported by Haab⁴ treated by the introduction of iodoform into the anterior chamber. After each introduction of the drug there was noted an arrest of the disease and shrinking of the tubercles, which continued for several weeks, and in the end there was marked improvement. Still more striking improvement has been reported by Koster⁵ from the injection of atmospheric air into the anterior chamber. The air was injected by means of a Pravaz syringe, a portion of the aqueous humor being first removed to make room for it. He reports two cases. One was of a girl, aged twelve years, on whom iridectomy had been done without favorable results. Three injections of air were followed by the gradual shrinking of the tumor, the clearing of the refractive media, and the general healing of the eye with vision of 6/18. In a girl, aged seventeen years, presenting isolated small tumors, six weeks' treatment by inunctions had produced no improvement and the eye was apparently doomed. Four injections of air into the anterior chamber were followed by the absorption of the tumors and the clearing of the cornea. The eye became quiet. In a third case, one of corneal tuberculosis, in which other treatment caused no improvement, four injections of air

¹ American Medicine, July 5, 1902.

² La Clinique Ophtalmologique, April 10, 1902.

³ Ophthalmic Record, June, 1902, p. 348.

⁴ Correspondenzbl. f. Schweizer Aerzte, April 15, 1902.

⁵ Klinische Monatsblätter f. Augenheilkunde, April, 1902.

were followed by the clearing up of the cornea and the healing of the eye. There seems good reason to try active local treatment for tuberculosis of the iris. It must not be forgotten, however, that Shieck¹ found that in some cases of iris tuberculosis recovery occurred spontaneously.

Uveitis. The changes caused by inflammation of the iris are so obvious, and when the iris is inflamed it is so difficult to observe the changes which at the same time occur in the deeper structures of the eye, that it is easy to ignore the latter or at least to fail to appreciate their importance. Probably in most cases of iritis that are not due to syphilis the gravity of the case, its special characteristics, and the particular indications for treatment depend more upon the changes that occur in other parts of the uveal tract than upon those in the iris. Changes in the choroid may be visible for months or years before any symptoms of iritis appear, and it is the lesions of the choroid, the ciliary body, the vitreous or the lens, rather than those of the iris, that cause permanent impairment of vision in such cases. In view of these facts the symposium and discussion upon inflammations of the uveal tract before the Section of Ophthalmology at the 1902 meeting of the American Medical Association² are important.

SIGNIFICANCE OF DEPOSITS ON THE CORNEA. This discussion brings out the true significance of the opaque spots on the posterior surface of the cornea that have commonly been spoken of as "keratitis punctata" or "descemetitis." There are two recognized forms of real punctate keratitis—the anterior, in which the specks of opacity lie so near the surface that it is disturbed and rendered irregular, and the syphilitic punctate keratitis, in which the points of opacity are scattered in the true corneal tissue. But it is certain that the symptom here under consideration is not due to inflammation of the membrane of Descemet or of any other part of the cornea. It is simply a deposit of opaque material on the inner surface of the cornea. Friedenwald³ thinks that if the older term is retained at all it should be in the form "keratitis punctata interna." He prefers the term "descemetitis," because it is brief and definite, although he recognizes the objections to it. He finds the deposit occurring in two forms: one marked by coarse dots of opacity, such as are readily seen with the naked eye, and the other in which only minute points of deposit are present that require the use of the ophthalmoscope with a strong convex lens to render them visible.

In general, such deposits on the posterior surface of the cornea indi-

¹ PROGRESSIVE MEDICINE, June, 1901, p. 414.

² Uveitis. Reprint from Transactions of the Section.

³ Journal of American Medical Association, September 27, 1902, p. 758.

cate inflammation of some part of the uveal tract. Friedenwald has found them in every case of iritis, almost constantly in exudative choroiditis, in cases of acute and chronic cyclitis, and in corneal or scleral inflammation probably accompanying uveitis. Failure to find other signs of uveal disease when these deposits are present he ascribes to "carelessness in the examination." Carelessness may be the right word for most cases, but certainly not for all. A large part of the uveal tract, including the ciliary region, cannot be directly inspected, and uveitis confined to this portion can be revealed only by the corneal deposits in connection with hyperæmia, pain, and tenderness. Of fifty-three cases in which the corneal deposits were not associated with keratitis or iritis, Friedenwald found in three-fifths of them exudative choroiditis. This he believes is the condition present, whether discovered or not, in those cases which have commonly been called "serous iritis" and "serous cyclitis"—terms which he hopes will be discarded.

De Schweinitz¹ points out that the connection of corneal deposits with choroidal disease was long ago referred to by Graefe; but the frequency and importance of this connection have not been realized. Woods,² in thirty-seven cases of choroidocyclitis, found corneal deposits present in twenty, and upon their presence or absence he bases his primary classification of such cases. Friedenwald has not found the deposits in disseminated, central, senile, or myopic choroiditis, nor with intraocular hemorrhage, or retinitis, except syphilitic retinitis, and in syphilitic uveal diseases it is frequently wanting.

VARIETIES OF UVEITIS. De Schweinitz calls attention to the following important forms:

1. Recurring and malignant uveitis terminating in secondary glaucoma and cataract. In these cases some form of choroiditis exists, sometimes for a long period, with frequent relapses. Then the disease extends into the ciliary body and iris, and, with repeated attacks, a secondary glaucoma is developed, each recurrence rendering the case more hopeless. This form may be equally severe in the two eyes, or in some cases one eye can be saved with useful vision.

2. Acute uveitis beginning as a sclerotico-choroiditis may terminate in myopia and posterior polar lenticular opacity. This form generally presents a patch of disease well forward, causing evident bulging of the sclera. There is much hyalitis with it, but comparatively slight involvement of the ciliary body and iris.

3. Mild chronic senile uveitis associated with hemorrhages in the vitreous occurs without involvement of the ciliary body or iris. In

¹ Journal of American Medical Association, September 20, 1902, p. 676.

² Ibid., p. 684.

one class of cases the hemorrhage follows the uveitis, and may ultimately clear up entirely. In another class the hemorrhage comes first, is more severe, and is followed by corneal deposits and involvement of the ciliary body and iris.

4. Insidious relapsing, plastic uveitis in gouty and rheumatic subjects may start with ill-defined choroidal changes and annoying scotomata. But in other cases the uveal disease is preceded by periodical conjunctival and episcleral congestions, attended with more or less burning or pain.

Woods describes a form of choroidocyclitis which he has never seen caused by syphilis, but finds associated with the establishment or abnormalities of menstruation, with intestinal disorders, acute infections, and nasopharyngeal disease. These cases show an especial tendency to relapse; and there are almost invariably deposits on the posterior surface of the cornea. He points out that "choroidal hyperæmia," especially with defective accommodation and vitreous opacities, requires a guarded prognosis, and areas of comparative dimness should be searched for in the visual field. Friedenwald found the deposits on the back of the cornea associated with cyclitis, cataract developing in young persons, glaucoma, circumscribed exudative choroiditis, syphilitic choroiditis (but not in all cases), circumscribed interstitial keratitis, and scleritis.

Wilder¹ recognizes the many varieties of choroiditis, but favors the simple classification of all cases under the two heads, suppurative and plastic. Of the latter form he reports two cases involving the region of the macula, which were not due to syphilis, nor was there other evident disease, although one patient was at the menopause.

TREATMENT OF UVEITIS. The first point urged by Marple² is the meeting of the general therapeutical indication revealed by investigation of the etiology. For acute processes due to syphilis the general indication is met by mercury, best by inunction. This may be aided by iodides, if necessary, for the absorption of exudates. Even without such specific indications mercurials are often of service, and salicylates may accomplish more than iodides. Locally atropine is generally indicated, aided in severe inflammation by moist heat and diaphoresis. While subconjunctival injections do no harm, it is not certain how much good they accomplish.

Woodruff³ insists on the value of pilocarpine and sweat baths in exudative choroiditis for the removal of exudates even when atrophy has commenced, for the clearing up of vitreous opacities, and even in

¹ Journal of American Medical Association, October 4, 1902, p. 820.

² Ibid., p. 825.

³ Ibid., p. 823.

checking the progress of choroidal degeneration in elderly people. His plan is to give a hypodermic injection of pilocarpine hydrochlorate the first thing in the morning, so as to have the stomach empty, the patient remaining in bed, warmly covered with blankets, and surrounded with bottles of hot water. Hot water, hot tea, or lemonade are to be given freely, and the sweating continued at least two hours, unless unfavorable symptoms arise. The skin is then to be dried and rubbed with alcohol, and the patient allowed to rest the remainder of the day.

These baths are to be given every other day until twelve have been taken, and after an interval of two or three weeks the treatment may be repeated. The usual dose of pilocarpine has been from one-eighth to one-quarter of a grain, beginning with a smaller quantity and increasing only if that should not produce profuse sweating. As bearing upon the action of pilocarpine in these cases, de Schweinitz suggests that the whole uveal tract sweats, as does the skin, that endogenous uveitis may be due to the excretion by it of micro-organisms or their products, and that to increased excretory effort under the influence of this drug is due its curative power.

Along with these sweat baths Woodruff gives potassium iodide in increasing doses with large quantities of water. The need of large doses, two or three drachms daily, in some cases is insisted on by Nobbe.¹ He prefers rubidium iodide, and believes the iodides more effective if given in connection with bromides. Connor,² who prefers sodium iodide, also refers to the value of large doses, but cautions against beginning with a large dose. Commencing with very small doses, giving it in milk, and increasing one grain a day, with an occasional sweat or purge, he finds that very large doses may be given with benefit, even to feeble patients.

For certain types of uveitis which recur in the late winter or early spring, and in which elimination by the kidneys is quite deficient, Colburn³ has prescribed a change of climate during the months of liability to recurrence. As above indicated, Marple regards treatment by sub-conjunctival injections with toleration rather than confidence. Much the same attitude is taken by Sandford.⁴ Lazenius⁵ believes that with injection of hetol the recovery is at least as rapid as with any other treatment.

¹ *Annales d'Oculistique*, October, 1902, p. 290.

² *Journal of American Medical Association*, October 4, 1902, p. 827.

³ *Ibid.*, p. 827.

⁴ *British Medical Journal*, November 1, 1902, p. 1432.

⁵ *Klinische Monatsblätter f. Augenheilkunde*, October, 1902, p. 256.

SYMPATHETIC DISEASE.

Sympathetic Posterior Uveitis. Quite in line with the above discussion of uveitis is a paper by Fisher¹ upon "Sympathetic Inflammation Affecting the Posterior Part of the Uveal Tract." He reports a case closely resembling those that have hitherto been reported as sympathetic neuroretinitis. The optic disk was swollen and obscured, the retina œdematous, the vision reduced to counting fingers at two or three feet. The pupil at first was not contracted, the iris not adherent; but subsequently the tension of the eyeball became diminished, two posterior synechiæ formed, and there were numerous dots of opaque deposit on the anterior capsule of the lens, and a few on the posterior surface of the cornea. In the end the tension of the eyeball was restored, and vision became normal with a normal field.

Fisher argues, convincingly, that cases like this are really cases of sympathetic uveitis, and that uveal inflammation will account for the condition of the optic nerve and retina, and the subsequent recovery of vision, which would have been scarcely possible were the condition really one of neuroretinitis. Early and great reduction of vision with subsequent recovery is quite the opposite of what occurs in neuroretinitis. In that condition vision may continue normal in spite of great swelling and disturbance of the retina and optic nerve, and then be permanently lost through atrophy as the inflammation subsides. Finally, the diminished tension of the eyeball, the punctate deposits on the cornea and lens, and the posterior synechiæ make it certain that the uveal tract was involved.

On reviewing some of the published cases of "sympathetic neuroretinitis," I have been surprised to find how constantly some such evidences of uveitis have been noted. The records of such cases bear out to a remarkable extent the view that sympathetic inflammation is always and essentially an inflammation of the uveal tract. Even the anomalous cases of keratitis, scleritis, and conjunctivitis may be closely analogous to similar lesions associated with other forms of uveitis.

Methods of Transmission. The question of how sympathetic disease extends from the "exciting" to the "sympathizing" eye is still unanswered. This is the conclusion of Asayama.² He justifies his careful record of an additional microscopic study of the subject by the hope that the facts thus rendered available will some time aid in solving the problem. De Schweinitz and Shumway³ conclude that it is

¹ Royal London Ophthalmic Hospital Reports, vol. v., part ii.

² Graefe's Archiv f. Ophthalmologie, Bd. liv., Heft iii.

³ Proceedings of the Pathological Society of Philadelphia, April, 1902.

some undiscovered condition, which may be constitutional or may be local, that determines whether the sympathizing eye shall be affected with disastrous inflammation or temporary irritation.

Gifford,¹ in reviewing the theories of sympathetic ophthalmia, points out that the modern view of infection propagated along the optic nerve and its sheath is not a return to Mackenzie's belief, that an irritation was transmitted from one retina to the other through the nerve fibres. He also suggests that without assuming the existence of a microbe capable of developing only in the uveal tract we might suppose that various species, after growing in the eye for a time, acquire an adaptation so that when carried by the blood-current they find in the uveal tract of the second eye conditions most favorable for their development. From what we now know of the predilection of other germs for certain tissues, the fact that sympathetic inflammation always attacks the uveal tract by no means excludes a bacterial explanation.

Treatment of Sympathetic Inflammation. The favorable prognosis for cases arising after the enucleation of the exciting eye is again illustrated by Fisher's case and by one reported by McDowell,² and various benefits are traced by Westcott³ to the removal of blind, injured eyes. Among drugs the claims of mercury are urged by Terrien,⁴ and it was an important part of the treatment employed by McDowell and Vail.⁵ Its value is elsewhere alluded to (*Injuries to the Eyeball*). It seems to me that one would be rash not to use it energetically in a case of this disease. But in spite of the general agreement as to its value, Gradle⁶ thinks "it cannot be said that there is any positive proof of its benefit in this disease."

To the salicylates more than to any other drug Gradle attributes the better results attained of late years. He finds that all observers who have used sodium salicylate in large doses (see *Treatment of Iritis*) agree that it has a pronounced beneficial influence. It, too, was employed by Fisher and Vail.

Vail also insists on the absolute exclusion of light from the retina to lessen the photo-chemical changes that become a burden while the nutrition is impaired by the uveal disease. Of the importance of this measure I do not feel certain. But if the attempt is made to exclude all light it is certain that his method, by the wearing of a mask lined with black silk, is much better and safer than that by confinement in a

¹ Archives of Ophthalmology, November, 1902.

² New York Medical Journal, August 9, 1902.

³ American Journal of Ophthalmology, August, 1902.

⁴ Journal des Praticiens, September 20, 1902.

⁵ American Journal of Ophthalmology, June, 1902.

⁶ Journal of the American Medical Association, May 31, 1902.

dark room. Shutting the patient entirely from light and air is certainly harmful, and may be disastrous.

Anomalous Cases. It is the extraordinary cases that are most likely to be placed on record. The extraordinary cases of sympathetic ophthalmia for the past year include one by Jessop,¹ in which the sympathetic uveitis occurred nine years after the injury, and the sympathizing eye showed cyst-like changes in the iris. Burnett² reports a case of sympathetic cyclitis coming on thirty-three years after the injury of the exciting eye. The exciting eye showed very little irritation. A case of sympathetic uveitis caused by subconjunctival dislocation of the crystalline lens is reported by Fromaget.³ At the July meeting of the Paris Ophthalmological Society, Wuillomenet⁴ presented a patient who had suffered in December, 1898, from subluxation of the lens in the left eye. In May, 1900, he had an iridochoroiditis of the right eye, which yielded to treatment but afterward relapsed. He had no history of rheumatism or syphilis, and was presented as a case of sympathetic ophthalmia. This view was contested by Chevallereau, who regarded the uveal inflammation as not dependent upon the injury of the other eye. These anomalous cases must always be regarded with doubt.

While it is generally accepted that sympathetic inflammation only occurs after traumatism of the exciting eye, we cannot admit that after an injury to one eye all inflammations that occur in the other, or even all uveal inflammations, should be ascribed to that injury. I have previously pointed out⁵ the confusion and harm that may come of such faulty reasoning.

DISEASES OF THE RETINA.

Obstruction of the Retinal Circulation. The evidences of interrupted or seriously obstructed retinal circulation are definite, positive, and generally understood. The exact pathological condition causing the obstruction is never so certain. To have one writer ascribing to embolism the group of symptoms that another labels thrombosis, and a third traces to spasm of the arterial walls, or hemorrhage into the optic nerve sheath, is confusing to say the least. It would be far better to have the bulk of these cases recorded as cases of obstruction of the

¹ *Ophthalmic Review*, January, 1903, p. 23.

² *Ophthalmic Record*, January, 1903, p. 38.

³ *Recueil d'Ophthalmologie*, November, 1902, p. 680.

⁴ *Ibid.*, July, 1902, p. 414.

⁵ *PROGRESSIVE MEDICINE*, June, 1902, p. 398.

retinal circulation, and the more exact diagnosis reserved for the few cases in which it can be made with the greatest probability.

It is sometimes justifiable to regard the obstruction as venous where the veins are decidedly overdistended and numerous hemorrhages are found in their course, as in a case seen by Schwenk.¹ Or the diagnosis of arterial obstruction may be made when the veins are found collapsed or shrunk shortly after the onset of the attack. Further than this we often cannot safely go; a more exact diagnosis is not warranted. This subject, as discussed a year ago,² is taken up by Thompson,³ who reviews the different explanations that have been put forth to account for arterial obstruction. He believes that there has been positive pathological proof that embolism occurs; that the possibility of obstruction from hemorrhage into the optic nerve sheath must not be left out of consideration; that we are justified in hesitating to accept the theory of primary arterial thrombosis; that there is such a thing as spasm of the central artery of the retina which may persist long enough to cause total blindness, and that proliferation of the intima does affect the retinal arteries, although its relationship to particular diseases is at present uncertain.

In view of the incompleteness of our knowledge of such cases, Thompson urges that the study of them should include, besides the examination of the heart and urine, careful inquiry for history of prodromal attacks; for possible causes of arterial spasm; evidence of conditions liable to produce thrombosis, as anæmia or pregnancy, and causes of arterial diseases, as syphilis. In the ophthalmoscopic examination it should be noted if the blood-column in the vessels appears granular, and, if so, whether it be stationary or moving to and fro, or steadily forward; whether arterial or venous pulsation is produced by slight pressure, and whether collateral enlargement has occurred in small vessels of the disk. One should also look for irregularities in the blood-column, which might be due to local thickening of the intima or other evidences of thickening of the vascular walls. He should also observe the size and character of the hemorrhages, and any vascular changes to be found in the fellow-eye.

It might be supposed that cases of obstruction of a single branch of the retinal artery, in which the point of obstruction was visible with the ophthalmoscope, would throw light on the pathology of such obstruction. Perhaps in future early and careful observation of these cases may do so. Up to the present time it has not. A case of the kind is

¹ Medical News, July 26, 1902, p. 190.

² PROGRESSIVE MEDICINE, June, 1901, p. 423.

³ Ophthalmic Review, March and April, 1902.

reported by Barkan.¹ His description is: "The inferior nasal branch of the central retinal artery was seen to have abruptly ceased at about one-half the distance between the centre and edge of the disk, as if torn off. Beyond that point the vessel was of thread-like appearance, very pale, and hardly visible." He thinks the case one of embolism rather than thrombosis, although the disturbance had been coming on for forty-eight hours before it was sufficient to prevent the patient from finding his way about with the damaged eye, and although no source for an embolism was discovered. He does not mention spasm of the artery, although that is an explanation which agrees better than either of the others with both the clinical history and the ophthalmoscopic appearance.

A case which seems to furnish positive evidence on several important points is reported by Haitz.² A girl, aged nineteen years, who had mitral insufficiency but no vascular disease and no cause for thrombosis, suffered from sudden blindness of the left eye. When seen a few hours later there was the retinal oedema and a cherry-red spot of obstructed circulation. Although the vessels appeared of normal size and the circulation was maintained, a venous pulse was produced by pressure. In the inferior branch of the artery, at the point where it bent over the margin of the physiological cup, appeared a white, egg-shaped mass. Subsequently this mass changed shape, applying itself to one side of the artery and leaving a free channel for blood upon the other. Vision improved rapidly, and within three weeks was restored to normal. If this case may be accepted at its face value, it seems to prove that an embolus lodged in a retinal artery may not become the starting-point of secondary thrombosis, but may so shrink as to permit a restoration of the blood-current and even of complete recovery.

In this connection it should be noted that in cases of obstruction of a single branch of the central retinal artery the obstruction usually occurs within the nerve head before the vessel comes into view. Such cases have been reported by Lawson³ and Walker,⁴ and in Lawson's case there was also pallor of the lower half of the optic disk. One might explain the tendency to obstruction in this situation by the better development of the muscular coat in this part of the arteries, or by the possible causes of obstruction which operate in this region of the head of the optic nerve. Pallor of the optic disk, if occurring as an early symptom of obstruction, would seem to indicate pressure outside

¹ Archives of Ophthalmology, January, 1902.

² Beiträge zur Augenheilkunde, April, 1902.

³ Transactions of the Ophthalmological Society of the United Kingdom, October, 1902.

⁴ Ophthalmic Review, July, 1902.

the artery, since the vascular supply of the disk is drawn from the other vessels. Later it would lose this significance, being then due to secondary changes in the affected portion of the retina.

Transient Blindness. Two interesting cases of repeated attacks of temporary blindness from exposure in facing cold winds are reported by Nettleship,¹ who ascribes them to contraction of the retinal and choroidal arteries. The patients both described the sensation as that of being enveloped in a thick, white mist which prevented them from seeing any object. Vision did not return until they got protection from the wind, and in one instance was not completely restored until after a night's rest. The blindness was not attended by pain or inflammation, and the eyes, when examined subsequently, showed no peculiarities. One of the patients had experienced the attacks only when climbing the higher Alps. It is possible that such attacks have been confused with snow-blindness.

Cases of temporary blindness of one eye more or less complete and occurring without any obvious exciting cause are not very rare, and occasionally both eyes are affected. Five cases of transient monocular blindness are reported by Posey,² who believes that such attacks are probably due to spasm in the walls of the retinal vessels, but that this spasm is induced by endarteritis. He regards it of the greatest importance to prevent the recurrence of such attacks, because in some cases the blindness has become permanent. He insists upon treatment and regimen to combat arterial sclerosis. At the time of attack nitrite of amyl should be used, and gentle but active massage. Zentmayer³ reports a case in which attacks of monocular blindness, lasting from three to ten minutes, had recurred for ten years. The eye had not been seen during an attack, but in the interval appeared entirely normal. Barrett⁴ reports a case in which the blindness was complete for two hours, with complete recovery an hour later. He thinks the pathology of these cases is probably embolism plus spasm.

Endarteritis. A case in which thickening of the internal coat of both arteries and veins was attended by intermittent impairment of vision, followed by complete blindness, retinal hemorrhages, and acute glaucoma, is reported by de Vries.⁵ One of the same general character, which was seen earlier and the process apparently checked, is reported by Markow.⁶ The patient came for sudden impairment of vision. The

¹ Royal London Ophthalmic Hospital Reports, vol. xv., part ii.

² Journal of the American Medical Association, May 31, 1902.

³ Ophthalmic Record, April, 1902, p. 218.

⁴ Ophthalmic Review, October, 1902.

⁵ Annales d'Oculistique, April, 1902, p. 293.

⁶ Archives of Ophthalmology, September, 1902.

ophthalmoscope showed retinal œdema, with an indefinite cherry-red spot in the macula. The retinal arteries were so contracted as not to be visible by the inverted image.

Raehlmann,¹ among 210 cases of arterial sclerosis, found changes in the retinal vessels in nearly 50 per cent. These were chiefly white streaks along the walls of the vessel, local dilatations, and local constrictions. He attaches great importance to the latter, believing them to be due to thickening of the intima. They are most frequently situated where the vessels make an abrupt turn on the disk. He suggests that at these points the vessel wall is irritated by the force of the current striking it. Changes of this kind go on for a long time without affecting vision; but when they reach a certain stage vision is liable to be suddenly impaired or interrupted. This may be from temporary influences that impair nutrition or lower the blood-pressure.

Treatment of Obstructed Circulation. The recognition of the exact condition causing obstruction of the retinal circulation is not merely a matter of scientific interest, but is also of the highest practical importance. Pathological conditions so varied demand different remedial measures or radical modifications of the same general line of treatment.

Take, for instance, massage of the eyeball, which has of late years been followed by some apparent cures of so-called retinal embolism. It has usually been done with the idea of dislodging an embolus, and causing it to be carried on toward the periphery of the retina, where it would do but little harm. In a case of thrombosis massage might prove harmful, and the cases in which it has seemed beneficial do not prove that it acts in the way supposed, or should be applied with a vigor which might be justified in an attempt to dislodge an arterial plug.

In Barkan's case it was applied in this way and improvement followed; but no corresponding change took place in the appearance of the obstructed vessel. Improvement was probably not due to dislodgement of an embolus, but to the establishment of a collateral circulation. There was developed on the disk a small anastomotic branch. The form of massage used in this case was backward pressure with the thumbs applied to the eye, rapidly increased until it was all the patient could bear. When this was maintained a half-minute the eye was suddenly released. The idea was that the pressure dammed the blood-current for a time, and upon releasing the eye there occurred a general flushing of the eyeball. It is very probable that massage may be even more efficient in relaxing arterial spasm than in loosening an embolus.

¹ Zeitschrift f. Augenheilkunde, June, 1902.

Or it may be a valuable means of combating endarteritis; but in the latter case it might not be well to apply so much force.

Markow, in the treatment of his case, employed the artificial leech, warm fomentations, nitrite of amyl, and galvanization. This last measure and confinement in a dark room produced only temporary improvement. Potassium iodide and sodium salicylate were also used, and vision was greatly improved, being brought up in the worse eye from 2/200 to 3/25. Posey's views as to treatment have already been mentioned. He does not think it proper to resort to iridectomy to lower the intraocular pressure, as advocated by Wagenmann, because of the risk of impairing vision by the operation.

Haitz, in the case above mentioned and in others, resorted to a paracentesis to lower blood pressure temporarily, and found it followed by improvement.

Treatment of Retinal Detachment. From recent literature on this subject one might suppose that a theoretical explanation of what a certain line of treatment ought to do serves as well to make it popular with the profession as its efficiency for the purpose for which it was instituted. Such popularity may last until the failures with that line of treatment become sufficiently numerous, or it may be cut short by the broaching of a more plausible theory.

With a condition like retinal detachment, which is supposed to be rarely capable of improvement, every case of recovery under a new plan of treatment raises exaggerated hope. The only cure for this is the faithful reporting of its failures. Just now the hope for retinal detachment turns toward subconjunctival injections, and there is the corresponding need that the failures of this plan of treatment should be as widely proclaimed as the successes.

Randolph¹ reports two cases. Neither of them was cured, although one, being a fresh detachment, was particularly favorable for testing the method. He finds, however, the tendency of this treatment to be good. The marked local reaction which invariably occurred he regards as an advantage, acting probably as a revulsive. In this it resembles the punctate cauterizations suggested by Dor, for which Gallus² claims eight cures in as many cases. It should be noted, however, that Dor³ has now adopted the treatment by injections, except where the detachment is situated far forward.

Randolph used a hypodermic syringe of the solution every other day. The first week he employed the physiological salt solution, then each week he increased the strength, so that by the fifth week he was

¹ Journal of the American Medical Association, October 11, 1902.

² Zeitschrift f. Augenheilkunde, December, 1901.

³ Annales d'Oculistique, May, 1902, p. 383.

using a solution of twenty grains to the fluidounce. The pain it caused increased with the strength of the solution, until it continued severe for hours afterward.

In one of Randolph's cases the retina seemed to be restored to normal position for a time, but detachment recurred a month later. De Schweinitz¹ reports a case of cure that lasted several weeks, until the patient passed from observation, by large subconjunctival injections of salt solution and scleral puncture. Confinement to bed, pilocarpine, sweating, and potassium iodide had proved ineffectual. De Schweinitz used only the physiological salt solution, although convinced that stronger solutions might be more active.

De Wecker,² who compares the cure of retinal detachment by subconjunctival injections with that of glaucoma by iridectomy, seeks to prevent the pain of strong salt solutions by employing the expressed liquid of the vitreous from the eye of the ox as the basis of the solution, adding thereto from 2.5 to 30 per cent. of salt. The pain caused by this fluid he claims to be very much less than that produced by plain watery solutions.

Dor employs for injection within the capsule of Tenon the following solution :

Sodium chloride	.	.	.	.	.	.	.	5.0 grammes.
Sodium carbonate	.	.	.	.	.	.	.	0.4 "
Sodium sulphate	.	.	.	.	.	.	.	0.4 "
Potassium sulphate	.	.	.	.	.	.	.	0.4 "
Sodium phosphate	.	.	.	.	.	.	.	0.1 "
Distilled water	.	.	.	.	.	.	.	20.0 "

This he injects through a long curved needle introduced between the externus and inferior rectus, so that it is deposited close behind the eyeball. The pain from such an injection is claimed to be much less than from a subconjunctival injection of a strong salt solution, but it seems to be sufficient to justify the administration of morphine.

De Wecker combats the view that the injections can be made wholly within the capsule of Tenon, and quotes Motais to prove that the capsule is so incomplete that fluid thrown into it will escape into the space immediately beneath the conjunctiva.

Thilliez³ reports a cure continuing for two months after subconjunctival injection of 30 per cent. salt solution which caused "atrocious pain during the whole night." Three injections were employed in the course of a week, and then a punctate cauterization of the sclera over the region of the detachment.

¹ Ophthalmic Record, March, 1902, p. 163.

² Annales d'Oculistique, August, 1902.

³ Journ. des Sciences Médicale de Lille, 1902, No. 37.

Grandelement¹ reports a case of very extensive detachment with high myopia in which instillations of a 5 per cent. solution of dionine were employed. These produced sharp reaction with pain, lacrymation, and chemosis. After each instillation the displacement of the retina was greatly diminished, but it recurred. Finally, salt solution was injected after the method of Dor, and complete reattachment, with restoration of vision, was secured. Two cases of failure to materially benefit detachment of the retina are reported by Rogers.² In one of these saline injections were used, and in both subretinal fluid was evacuated through a scleral opening.

Taking only the reported cases one might feel justified in a very hopeful view of this treatment of retinal detachment; but it must be remembered that Randolph's and Rogers' cases represent the great majority which remain unreported, while those that terminate favorably are generally placed on record, if only because of their extreme rarity. Then, too, we have cases like one reported by Higgins,³ in which, after several months of treatment, that included rest in the horizontal position and vapor baths, the detachment continued; but two months later when not under any treatment it spontaneously disappeared, and the restoration continued complete at the end of a year and a half.

With a single exception, Knapp⁴ has seen only temporary reattachment. Risley has seen a permanent cure only when the detachment was produced by traumatism in an otherwise healthy eye, although he has seen a temporary cure lasting several weeks after the injection of a salt solution. On the whole we may conclude, in regard to injections of salt solutions, that this method should be given place with absolute rest in bed, pilocarpine sweats, evacuation of subretinal fluid, and cauterization of the sclera as likely to produce temporary improvement in retinal detachment, with a possibility that it may effect a permanent cure. Perhaps, as compared with others, de Schweinitz is correct in thinking it the best method recently employed.

DISEASES OF THE OPTIC NERVE.

Treatment of Optic Neuritis. The efficacy of craniectomy in curing choked disk is illustrated in a case reported by M. Dupuy-Dutemps⁵ to the Ophthalmological Society of Paris, December 2, 1902. The

¹ Recueil d'Ophthalmologie, November, 1902, p. 683.

² Transactions of the American Ophthalmological Society, 1902, p. 525.

³ Ophthalmic Review, August, 1902, p. 234.

⁴ Journal of the American Medical Association, October 11, 1902, p. 910.

⁵ La Clinique Ophthalmologique, December 25, 1902, p. 366.

case is reported as one of neurofibromatosis with increased intracranial pressure. There was a history of severe headaches for four years, with cerebral vomiting and impairment of vision for eight months. When first seen there had been complete loss of vision in the left eye for four months, and it was reduced to counting fingers at four metres in the right, with contraction of the field. Treatment with mercury and iodides had caused no improvement. The neuritis was passing into atrophy, which was more advanced in the left eye. In two weeks after operation the choking of the disk was clearly less, and in six weeks all trace of it had disappeared. Vision in the right eye rose to $1/5$ and the field slightly enlarged. The left remained entirely blind. In discussing the above case, and subsequently more in detail, Pechin reported one of intracranial cyst in which trephining made a complete cure. He had also seen one of gumma of the cerebellum in which the neuritis persisted unchanged after the operation until the patient's death, six weeks later. Chaillous¹ reported a case of lasting improvement produced by lumbar puncture with the escape of 22 c.c. of cerebrospinal fluid; but in another case repeated punctures had failed to give relief. Abadie urged the importance of persistent trial of mercury and potassium iodide in full doses before resorting to operation. Fischer² urges strongly the value of iodides in bringing about comparative or complete recovery even in cases of severe neuritis. He gives the preference to rubidium iodide, both on account of its therapeutic activity and of the large doses in which it can be safely given.

Hereditary Optic Neuritis. This form of hereditary disease probably begins as an inflammation of the retina in the region of the macula, and of the related portion of the optic nerve. But it is usually seen as a subsequent atrophy, when the ophthalmoscopic changes are more striking. In nearly all the cases hitherto reported the impairment of vision, chiefly central vision, has been permanent.

Nettleship,³ however, reported to the Ophthalmological Society of the United Kingdom, October, 1902, two cases of complete recovery. These patients were sons of sisters. One was twenty-eight and the other thirty-five years of age when attacked, and each had a brother who suffered from a similar condition, but who did not recover. In discussing these cases Frost stated that he had seen two brothers, one of whom had recovered completely, and the other was also said to have recovered. Ormond had seen a partial recovery in a patient, a brother of whom had the typical atrophy. Lawford had seen the disease in three brothers, one of whom had recovered vision of $6/12$, so that he

¹ La Clinique Ophtalmologique, January 25, 1903, p. 28.

² Wochenschrift f. Therapie und Hygiene des Auges, May 1, 1902.

³ Ophthalmic Review, December, 1902, p. 354.

could read a newspaper and resume his work. With reference to one of Nettleship's cases, it might be urged that he was a heavy smoker, but no such objection appears in connection with the others.

Optic Atrophy. In a discussion of the rarer forms of optic atrophy before the Section of Ophthalmology of the British Medical Association, Hawthorne¹ pointed out that any fruitful study of the subject must be based on something more than opinions regarding the appearance of the optic disk; that clinically optic atrophy is an inference rather than an observed fact. The diagnosis rests on evidence from three different sources: the central vision, the visual field, and the appearance of the optic disk.

Harman compared the optic nerve fibres to the central axons of the posterior root ganglion cell in the spinal cord. The trophic influences, he thought, came from the retinal cells, hence the primary damage was to be looked for in those cells. Such a view is strongly supported by recent studies of the pathology of toxic amblyopias; but McGillivray called attention to the inability of this view to explain atrophy following injury to the nerve at the optic foramen.

Taylor discussed optic atrophy associated with disseminated sclerosis. He believed the atrophy in such cases was due to retrobulbar neuritis. He had never seen such atrophy cause complete blindness, while tabetic atrophy almost always went on to blindness. He called attention to the small amount of tobacco that might cause amblyopia and atrophy if glycosuria were present. Holmes Spicer² referred to the unreliability of the patient's testimony as to the amount of tobacco used. He admitted that central amblyopia does occur with diabetes, and he had seen primary optic atrophy with diabetes insipidus.

TREATMENT OF OPTIC ATROPHY. The value of increasing doses of strychnine by subcutaneous injections into the temple is upheld by Derby. He has had twenty-six cases thus treated. In fifteen the disease progressed and terminated in blindness. In eight there was cessation of its progress, with occasionally a slight increase in the limits of the field and in the acuity of vision. He believes that in progressive cases of optic atrophy it is the physician's duty to give the patient the opportunity of trying this treatment.

Probably as to the advisability of a trial of strychnine in such cases there would be pretty general agreement; but with many others I am not convinced that it must be given by hypodermic injections into the temple. Probably until we have evidence which indicates both the form of the atrophy and the physiological conditions with which it is

¹ British Medical Journal, November 1, 1902, p. 1438.

² Boston Medical and Surgical Journal, May 15, 1902.

associated, so that we can estimate with probability the tendency to blindness in each particular case, the real value of any especial line of treatment must remain uncertain.

TOXIC AMBLYOPIAS.

Methyl Alcohol Amblyopia. The need for popular education as to the dangers of wood alcohol and greater caution regarding its sale and use are strikingly illustrated in the literature of the last year. Now that the definite clinical picture of wood alcohol poisoning is more generally understood it is recognized with increasing frequency. Ring¹ tells of the case of a family of Poles living in Connecticut who used a beverage made of wood alcohol, coffee, and sweetened water. One debauch on this mixture resulted in one death and two cases of blindness, and there was a history of a similar death and one case of temporary blindness following the use of a similar mixture some years before in the same family.

Sherer,² of Kansas City, reported five cases of amblyopia from this cause. A number of cases of blindness brought to the New Orleans Eye, Ear, Nose, and Throat Hospital were traced to the use of a cheap antiseptic, which was found to contain as much as 30 per cent. of methyl alcohol.³ Hallock⁴ reports a case of double optic atrophy from drinking a teacupful of wood alcohol, and still another case in which the drug was taken in an extract of Jamaica ginger is reported by Burnett.⁵ Evidently the ways in which the poison may gain entrance to the system are numerous.

Fortunately, the diagnosis can be made with great certainty from the clinical picture presented.⁶ But the study of the manner in which the poison came to be used is of great importance in the direction of preventing such occurrences in the future. So characteristic is the clinical picture that when a case of the kind was reported at the last meeting of the Western Ophthalmologic and Otolaryngologic Association, without any suggestion or apparent suspicion of its cause, three members who had seen cases of the kind promptly offered a positive diagnosis of methyl alcohol poisoning. In this connection, however, it must be borne in mind that sudden blindness from drinking ordinary alcohol has been observed several times. The last case of the kind is reported

¹ Transactions of the American Ophthalmological Society, 1902, p. 529.

² Medical News, October 25, 1902, p. 804.

³ Philadelphia Medical Journal, August 16, 1902, p. 209.

⁴ Archives of Ophthalmology, May, 1902, p. 290.

⁵ Ophthalmic Record, June, 1902.

⁶ PROGRESSIVE MEDICINE, June, 1900, p. 363.

by de Bono,¹ whose patient ultimately recovered vision of 1/3. While the subsequent course of such a case distinguishes it from wood alcohol poisoning, a differential diagnosis might not be possible in the beginning.

DISEASES OF THE CRYSTALLINE LENS.

Cataract. The influence of naphthalin in producing cataract is well known, and cases of opacity of the lens from its therapeutic use have been recorded.² The manner in which this effect is produced is of especial interest as promising to throw some light upon the production of the common forms of cataract. It has been studied by Peters³ and Sala,⁴ the latter reporting a series of experiments upon dogs. They find that a constant effect of large doses of naphthalin is damage to the pigment epithelium of the ciliary processes. The cubical cells become irregular, "frayed," "blistered," and the layer whitened by vacuolation. Along with these changes there occurred irregular refraction or opacity of the lens.

Lens Extraction with Conjunctival Flap. Wilson and Miles⁵ report an individual experience of seventy-four cases with this method of operation, and the study of the frequency with which it is resorted to and the reasons given for adopting it by other operators. They find that the adhesive power of such a flap is so marked that if it fall into place before the removal of the lens no ordinary pressure on the globe will dislodge it, and it becomes necessary to reopen the wound with the spatula. After the completion of the operation and the replacement of the flap it did not fail to adhere and remain in position in any case. All delayed healing was confined to the ends of the wound unprotected by the flap. They find that with the conjunctival flap the iris gets into the wound a little more frequently—nine times in seventy-four cases; but in only two of their cases was there anything like prolapse of the iris. The making of such a flap, they conclude, does lengthen and sometimes complicate the operation; but, on the other hand, the reopening of the wound is prevented by it.

Subconjunctival Extraction. The method of Pansier and its difficulties and advantages have been described in a previous volume.⁶ Very much the same operation has been done by Poduschka,⁷ who con-

¹ Recueil d'Ophthalmologie, November, 1902, p. 667.

² PROGRESSIVE MEDICINE, June, 1902, p. 380.

³ Transactions of the Heidelberg Ophthalmological Society, June, 1902.

⁴ Klinische Monatsblätter f. Augenheilkunde, January, 1903.

⁵ Transactions of the American Ophthalmological Society, 1902, p. 503.

⁶ PROGRESSIVE MEDICINE, June, 1900, p. 371.

⁷ Klinische Monatsblätter f. Augenheilkunde, October, 1902, p. 269.

siders it indicated for dislocated lenses, hypermature cataracts, when there is danger of reopening the wound by muscular spasm or it seems best to use the open-wound method of after-treatment. In discussing Poduschka's paper, Czermak urged the advantages of keeping a broad flap of conjunctiva, 12 mm. If iridectomy were required it could be made through a button-hole cut in the centre of the flap. Fergé mentioned that by the use of adrenalin bleeding into the anterior chamber, a chief cause of difficulty with the operation, could be greatly lessened.

Extraction with Double Corneal Flap. A curious operation for complicated cataract or luxated lens is described by Müller.¹ He first makes a flap that includes only part of the thickness of the cornea by passing a very narrow Graefe knife through the upper limbus, but not deep enough to enter the anterior chamber. The strip of limbus included is about 5 mm. broad. The edge of the knife is turned toward the centre of the cornea, is made to cut a flap extending 2 mm. from the corneal margin, and is then turned forward so as to terminate the flap as squarely as possible. Then stitches are introduced at the angles of the flap and drawn aside. Next a second incision is made in the corneoscleral junction as for ordinary simple extraction, except that this incision terminates in the previous incision and does not cut off the flap of cornea already formed.

The subsequent steps of the operation are much the same as for ordinary extraction; but when these have been completed the first corneal flap can be fastened to the other part of the cornea by the stitches passed through either angle. These stitches Müller introduces before making the second incision, so that they can be immediately tightened when the other steps of the operation have been completed. While this operation is ingenious and sufficiently suggestive to deserve mention here, it seems to me distinctly inferior to the retention of a conjunctival bridge, in that the corneal tissue is non-vascular. The stitches introduced early in the operation (as they must be to prove of service for the closure of the wound) must interfere with the subsequent steps of the extraction almost as much as the retained bridge of conjunctival tissue.

Division of Opaque Capsule. The division of the opaque capsule by a double-edged knife introduced through the conjunctiva and sclera so as to enter the periphery of the anterior chamber, as suggested by Kuhnt, has been previously described.²

Wokenius³ reports an experience of 244 operations by this method, which fully bears out what has been said of its advantages. There was

¹ *Klinische Monatsblätter f. Augenheilkunde*, January, 1903.

² *PROGRESSIVE MEDICINE*, June, 1900, p. 375.

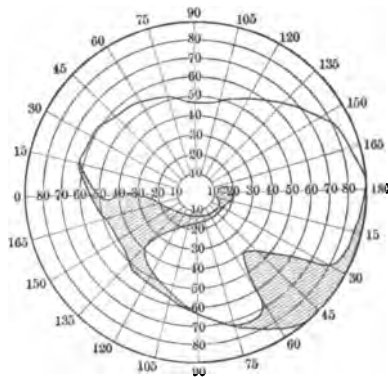
³ *Zeitschrift f. Augenheilkunde*, April, 1902.

not one case of infection or of glaucoma or iridocyclitis. In 14 cases the ciliary injection was prolonged. There was light iritis in 5 and more severe iritis in 2. In view of the disastrous results which have sometimes followed operations through the cornea, the subconjunctival method should largely, perhaps entirely, replace the corneal puncture.

GLAUCOMA.

Sector Defects of the Visual Field. A dozen years ago Bjerrum¹ called attention to a form of defect in the visual field in glaucoma, in which the blind portion extended inward from the periphery to the physiological blind spot. Such defects have been observed by a few other writers, one of whom suggested their dependence on changes in the walls of the vessels, impairing the nutrition of a sector of the retina so much as to cause its blindness. Friedenwald² reports a case of the kind, carefully and repeatedly studied, in which he found "no corre-

FIG. 44.



Sector defects of field. (Friedenwald's case.)

spondence whatever" between the sector defect and the course of the retinal arteries, and the arteries appeared perfectly healthy. He, therefore, corroborates Bjerrum's view that such defects are due to impairment of certain groups of nerve fibres as they pass through the excavated nerve head.

Pathology of Glaucoma. The effects of introducing various substances into the eye through the circulation have been studied upon cats and rabbits by Coburn.³ They caused congestion of the ciliary body and iris, with vesicle formation in the ciliary region and fibrinous exudate, that formed deposits on the anterior surface of the iris and in

¹ Transactions of the Tenth International Medical Congress.

² Annals of Ophthalmology, April, 1902.

³ Ibid.

Fontana's spaces. When the irritation was brief the exudate might be absorbed ; but if prolonged it gave rise to glaucomatous iritis. These changes were most striking after injections of eserine and sodium salicylate.

Schoen,¹ taking for his text the failure of our usual therapeutic resources in the case of Javal,² opposes the common view that glaucoma is, essentially, increased intraocular tension. He thinks that simple glaucoma is explained by degeneration of the ciliary muscle, and there is no hope of curing a well-established case, although the progress may be checked by correcting errors of refraction and insufficiency of the internal recti muscles. Schoen's statistics, showing that 80 per cent. of glaucomatous eyes are hyperopic or astigmatic and the others presbyopic, are of no significance, because the same would be equally true of non-glaucomatous eyes, at the age when glaucoma is liable to develop, and the supposed prevention of glaucoma before it is fully developed is such an uncertain thing as to afford no basis for scientific reasoning. Still the possible influence of lessened activity of the ciliary muscle and the significance of cupping of the disk in non-glaucomatous eyes, to which he attaches importance, should be considered before attempting to formulate a theory of glaucoma.

Etiology of Glaucoma. From the unpublished proceedings of the New England Ophthalmological Society, Standish³ has brought together reports of 32 cases of acute glaucoma, in 27 of which the supposed precipitating cause is mentioned. He divides the causes into two classes—the mental and the local. Of this series of cases the outbreak is ascribed in 2 to worry ; in 1, to fright ; in 1, to fear of an approaching operation ; in 4, to operations performed under ether ; in 1, to mental shock ; 4 are ascribed to pain, 2 being from toothache and 2 from ophthalmic zoster. In 1 the attack was attributed to exposure to cold. In 14 cases the attack followed the use of various mydriatics, atropine, homatropine, duboisine, scopolamine, and cocaine.

The *influence of season* upon the occurrence of attacks of acute primary glaucoma has been studied at Hirschberg's clinic by Steindorff.⁴ He found that of 102 attacks 65 occurred between September 1st and April 1st, and 37 in the other half of the year. The maximum was reached in December and January and the minimum (none) in June. The number of cases is not sufficient to be conclusive, but the comparative immunity from attacks in the early summer is so striking as to call for further investigation.

¹ Ophthalmic Record, October, 1902.

² PROGRESSIVE MEDICINE, June, 1902, p. 389.

³ Ophthalmic Record, May, 1902.

⁴ Centralblatt f. praktische Augenheilkunde, August, 1902.

Treatment. It is noticeable that acute glaucoma produced by mydriatics is quite amenable to treatment. In three of the above cases iridectomy was done almost immediately, but the others are all reported as cured by the use of myotics. It should be noted, however, that only in one case were myotics used successfully for a period of years.

In two other cases, in which they were relied on, vision was lost. While many surgeons treat certain forms of glaucoma without operation there is little of importance that is new on the non-operative treatment. The chief discussions of the past year have dealt with iridectomy and sympathectomy. Panas¹ advocates for cases of recurrence after iridectomy a free opening near the old scar. He also finds that the true filtration space extends somewhat behind the base of the iris. To open this space he introduces a Graefe knife 2 mm. behind the margin of the cornea and 2 mm. above its lower margin, and makes an incision into the posterior chamber. In three cases out of ten this incision permitted the escape of considerable fluid and gave marked relief.

IRIDECTOMY FOR SIMPLE GLAUCOMA. The postoperative history of 50 cases of simple chronic glaucoma is reported by Bull.² Iridectomy was done upon 94 eyes in such a way as to include the root of a broad piece of iris. These cases were under observation from one to twenty years, the average being about five years. The acuteness of central vision improved temporarily in 7 eyes and permanently in 3. In 2 it grew worse immediately, and in 58 it gradually failed. In 24 the existing vision was maintained for periods of from two to eighteen years, with an average of nearly seven years. The permanent results in regard to the field of vision were somewhat less favorable. Bull finds the operative effect of iridectomy in these cases is more certain the earlier it is done, and that done early it offers the best prospect for the arrest of the process, and its effects are either permanent or very prolonged.

Bull noticed that better results were obtained by simultaneous operation on the two eyes. Theobald, in discussing this point, said he would operate first on one eye and be guided by his experience with it as to a second operation. Pagenstecher,³ in double glaucoma, operates first on the worse eye, believing that its reaction to operative interference gives instructive indications regarding operation on the other. He has also observed many times that the continuing glaucomatous process in one eye exerts an unfavorable influence on the other. In discussing Bull's paper, Pooley and Chandler said they avoided iridectomy for simple glaucoma, but the latter described an operation which he did instead.

¹ Archives d'Ophthalmologie, February, 1902.

² Transactions of the American Ophthalmological Society, 1902, p. 429.

³ Wochenschrift f. Therapie u. Hygiene des Auges, July 24, 1902.

DIVISION OF THE ANTERIOR CILIARY ARTERIES. Chandler¹ believes that when tension is increased and vision diminished, but no acute symptoms of glaucoma are present, the trouble may be due to dilated and altered arteries. In this class of cases he has divided the anterior ciliary arteries before they perforated the sclera, and in every instance this has been followed by lower tension, improved vision, and relief from pain. Standish, who had seen some of the cases thus treated, also testified to the immediate diminution of tension and stopping of pain.

REMOVAL OF THE CILIARY GANGLION. This is the latest operative treatment for glaucoma. It has been resorted to only in cases of absolute glaucoma by Rohmer,² who reports seven cases. In every case it gave marked relief from pain, even where iridectomy and sympathectomy had failed to do so. Involving as it does the destruction of the sensory and motor functions performed through this ganglion, it is necessarily an operation of last resort, to be compared with enucleation of the eyeball or opticociliary neurotomy, rather than with the usual glaucoma operations. In most of his cases Rohmer effected his purpose by means of Kronlein's osteoplastic operation.³

The chief difficulty of the operation is in finding the ganglion. To aid in the search for it, Rohmer gives the following distances of the ganglion from prominent points of reference as ascertained by his pupil, Mlle. Kaminska, in six subjects :

Distance of ganglion from—

Upper, outer angle of orbit	37 to 41.5 mm.
Upper, inner angle of orbit	30 to 48 mm.
Middle of upper border of orbit	38 to 46.5 mm.
Middle of lower border of orbit	37 to 48 mm.
Optic foramen	8 to 10.5 mm.
Junction of the optic nerve and sclera	14.5 to 17 mm.

The ganglion lies slightly to the temporal side of and below the optic nerve. The filaments which form its roots are quite fine, and its small size, 2 mm. long by 1 mm. in its short diameter, make it really difficult to identify in the living body. It is probable that if its removal is often done it will sometimes be effected by the excision of a larger mass of tissue containing it.

That is how the operation was done by Aubaret,⁴ who frankly reports his inability to recognize it. In his case the result was less satisfactory than in Rohmer's cases. Considerable exophthalmos ensued, severe neuroparalytic keratitis followed, and the eye had to be enucleated six weeks later. It is safe to predict that an operation involving the diffi-

¹ Transactions of the American Ophthalmological Society, 1902, p. 462.

² Annales d'Oculistique, July, 1902.

³ PROGRESSIVE MEDICINE, June, 1902, p. 416.

⁴ Annales d'Oculistique, August, 1902, p. 123.

culties, the scar, and the risk of Kronlein's osteoplastic flap, simply to avoid the wearing of an artificial eye, will not come into very general use.

SYMPATHECTOMY. During the past year the removal of the superior ganglion of the cervical sympathetic for glaucoma has been more frequently done than in any year preceding; but there is little to add to what has been previously said on this subject.¹ Rohmer² reports 17 cases and tabulates previously reported cases, making in all 114. Of these, 79 are set down as improved, 6 as worse after the operation, and 29 as not improved. The proportion of cases benefited appears to be nearly the same for the different forms of glaucoma, except that all the cases of hemorrhagic glaucoma—5 in number—are reported as benefited.

Weeks³ reports 4 cases, in 2 of which both the superior ganglia were excised. He concludes that in all forms of glaucoma, except the hemorrhagic, iridectomy should be tried first. In discussing Weeks' paper Bull reported 3 cases, in 2 of which some improvement followed.

Bull is inclined to think that myosis is the only effect of the operation which usually persists. Panas and others make the same observation. If this be true possibly extreme dilatation of the pupil during the attack may constitute an indication for the operation, and simple glaucoma, in which the pupil is not much dilated, may not be the form most benefited by this operation.

Two cases of subacute inflammatory glaucoma are reported by La Motte⁴ as practically cured by sympathectomy. They resemble the case reported by Black, and referred to last year. They renew the suggestion that sympathectomy may prove most efficient in the class of cases most likely to be benefited by iridectomy. In accepting sympathectomy as an established therapeutic resource for glaucoma its place may be assigned in the words of Marple:⁵ "It does not replace iridectomy, but may possibly supplement the latter in case this is refused or has already resulted disastrously in the other eye, or is contraindicated, as in hemorrhagic glaucoma, dacryocystitis," etc.

LACRYMAL PASSAGES.

Tests of Capacity. In case of overflow of tears without complete obstruction of the passages, Kalt⁶ tests their permeability by instilling at the inner canthus a physiological salt solution, and noting how many drops of this will be carried off through the canaliculi in a certain number

¹ *PROGRESSIVE MEDICINE*, June, 1902, p. 392.

² *Annales d'Oculistique*, May, 1902.

³ *Transactions of the American Ophthalmological Society*, 1902, p. 441.

⁴ *Ophthalmic Record*, October, 1902.

⁵ *Medical Record*, May 10, 1902.

⁶ *Recueil d'Ophtalmologie*, October, 1902, p. 605.

of minutes. The patient lies down during the test and must be free from emotional excitement. The amount of fluid thus disposed of by different persons in health varied from one-fifth of a drop to three or four drops per minute.

To ascertain if a lacrymal obstruction be complete, Antonelli¹ instils near the inner canthus a drop of an alkaline solution of fluorescein, such as is used for staining the cornea. The patient is kept quiet for thirty seconds or a minute, and then is requested to blow his nose. If the passages are at all permeable the secretion on the side tested will be found discolored. When the obstruction is partial a slight discoloration may be found two minutes or more after the instillation. In making these tests the patient should avoid "clignement"—pressure or "nipping" of the lids. Such pressure seems to force out the contents of the lacrymal sac.

Ligation of the Canaliculi. The danger of operations and wounds involving the cornea in the presence of suppuration of the lacrymal sac is universally recognized. Cataract extraction performed in the presence of dacryocystitis is likely to aid in the destruction of the eye. The slightest injury of the cornea becomes infected and reinfected, until corneal suppuration renders the eye useless. The treatment of the dacryocystitis, recommended before proceeding to any operation, or in connection with corneal injuries, requires much time, and fails to secure reliable immunity. Temporary closure of the puncta by the galvano-cautery has been tried, but after the failure to save an eye in that way it occurred to Buller² to ligate the canaliculi.

This operation he has tried on three cases with complete success—two of cataract extraction and one of corneal injury. In one of the cataract cases the other eye had been previously lost by infection of the operative wound. He uses for the ligature No. 2 iron-dyed silk. This is threaded in a fine curved needle and passed around the canaliculus a little to the nasal side of the punctum. The ligature has been allowed to remain from seven to fourteen days. It caused little swelling or reaction and after its removal there was no difficulty in passing a small probe through the canaliculus.

Incision of the Sac. Terson³ points out that when the sac is not distended and has been distorted by previous inflammation it is not easy to make a cutaneous incision directly into it. In such cases he introduces a strabismus hook through the canaliculus, and presses its bulbous end against the anterior wall of the sac to serve as a guide. The suggestion is such an excellent one that I refer to it, although it

¹ Recueil d'Ophtalmologie, November, 1902, p. 646.

² Transactions of the American Ophthalmological Society, 1902, p. 633.

³ Annales d'Oculistique, July, 1902, p. 26.

was made in this country five years ago by Prince.¹ With such a guide, Terson points out, it is easy to inject a local anæsthetic into the tissue to be divided, and thus to operate on the sac without a general anæsthetic.

DISORDERS OF OCULAR MOVEMENTS.

Reflex Nystagmus. Six cases of this form of acquired nystagmus are reported by Baer.² He speaks of the condition as brought about reflexly from the conjunctiva or cornea in persons otherwise normal and having good vision, and in two of the cases the nystagmus ceased after the removal of a foreign body and the healing of corneal erosions; but it may be noted that all of his cases except one had marked errors of refraction with high exophoria, and the report of the one exception says nothing about the refraction or muscle balance. Apparently the exhaustion produced by eyestrain is a necessary condition of the development of these spasmodic movements. The twitching was not confined to the external muscles, but variations in the width of the pupil and alternating macropsia and micropsia accompanied the nystagmus.

Retraction Movements. Cases of this kind have been described and illustrated two years ago.³ Two additional cases are reported by Evans,⁴ who also tabulates the previously reported cases, making twenty-seven in all. He discusses the two theories suggested to account for these movements, both of which he thinks may apply in varying degree in different cases. In the treatment of such patients he considers it the surgeon's duty to expose and carefully examine the tendons of both the external and internal recti, to ascertain if the insertions are normal, or if accessory bands are inserted farther back, or if a muscle be replaced partly or wholly by fibrous tissue. He points out that a cure would sometimes require both the advancement and the lengthening of the tendon; but he suggests no operation to accomplish this.

Advancement Operation. An operation for advancement of both muscle and capsule with excision of redundant tissue is described by Worth.⁵ He uses two sutures, one for each edge of the tendon to which it is looped, and fastens them through the "tough circumcorneal fibrous tissue." He uses thick black silk, No. 24, which is sterilized by boiling, and then soaked in boiling paraffin wax. The thickness of the silk prevents it from cutting through the tissues, and to make more sure of

¹ Transactions of Section on Ophthalmology of the American Medical Association, 1898, p. 198.

² Archives of Ophthalmology, November, 1902.

³ PROGRESSIVE MEDICINE, June, 1901, p. 456.

⁴ Ophthalmic Review, January, 1903.

⁵ Annals of Ophthalmology, July, 1902.

this it is doubled. The wax prevents it from kinking and also renders it comparatively non-absorbent.

Capsular Ligature. Under the name "ligature capsulaire" Trousseau¹ describes an operation which he thinks will largely replace capsular advancement. He has used it with tenotomy of the opposing rectus and alone. He describes it as performed for convergent strabismus. The eye being turned strongly inward, a wide portion of the conjunctiva and underlying tissue, including the tendon of the external rectus, is grasped with toothed forceps, and forcibly raised from the sclera. A half-curved needle carrying the ligature is then introduced near the sclerocorneal junction and carried back in close contact with the sclera beneath the external rectus muscle. It is brought out through the muscle and attached tissues, the capsule and the conjunctiva near the external canthus. After tenotomy of the internal rectus, if this is done, the ligature is tightened so as to draw the eye into the desired position, an overcorrection of not more than 5°. The tightening of the ligature draws the tissues into a mass or roll beneath the conjunctiva. This causes no permanent deformity, but subsequently atrophies and disappears. The ligature is left in position for six to twelve days.

Trousseau has performed this operation some forty times. Five of his cases were followed for ten months. In one case divergent strabismus of 20° was corrected by the ligature, in connection with a free tenotomy. From 10° to 15° of convergent strabismus have been corrected by the ligature alone. The operation is simple and not terrifying to the patient. It will probably receive the trial at the hands of others than the inventor that will be required to test its real value.

TUMORS.

Tuberculous Growth from the Optic Nerve Head. A case of this kind was referred to three years ago.² Within the past year two additional cases have been recorded. Both eyes were enucleated on a diagnosis of retinal tumor, and only the subsequent microscopic examination revealed the character of the growth. The accompanying illustration shows a section of the eyeball in the case reported by Arnold Knapp.³ The eye was that of a two-year-old negro child, who had always enjoyed good health. Its parents were healthy, but another of the children had presented evidences of tuberculosis, and its grandmother had died of phthisis. The retina was wholly detached, and the

¹ *Annales d'Oculistique*, January, 1903, p. 17.

² *PROGRESSIVE MEDICINE*, June, 1900.

³ *Archives of Ophthalmology*, January, 1903.

space behind it occupied with opaque, gray coagulum. The tumor projecting from the nerve head was 6 mm. broad, white, solid, composed of granulation tissue, with giant-cells, miliary tubercles, and central necrosis.

The other case is reported by Michel.¹ The tumor, which was recognized as a retinal tumor, with hemorrhage into the vitreous, occurred in a ten-year-old child. Contrary to what was observed in other cases, there was increased tension of the eyeball. In the five

FIG. 45.



Tuberculosis of head of optic nerve. (Knapp's case.)

cases now on record the growth has been monocular. The patients' general health does not seem to have awakened suspicion, except that one child afterward died of tuberculous meningitis. The youngest patient was two, the oldest twenty-seven years old. The condition is of interest on account of the difficulty of diagnosis. This is probably still insurmountable before the removal of the eye; but while the indication for prompt removal may not be so urgent as in the case of other intra-ocular tumors, a mistake in diagnosis leading to removal will be no misfortune to the patient.

¹ Münchener med. Wochenschrift, January 6, 1903.

Sarcoma of the Ciliary Body and Iris. Eight new cases, one of their own and seven from the practice of other surgeons, are reported by Wood and Pusey.¹ With these they have collected abstracts of new cases from private records, making twenty-three in all. These they have studied in connection with sixty-four cases, records of which have been previously accessible.

Regarding the anatomy they find that the expressions "diffuse sarcoma" and "circumscribed sarcoma" are really only relative. Absolutely circumscribed sarcoma of the eye is certainly a great rarity; practically all are diffuse growths. Histologically, these tumors present no special characteristics. They consist in nearly all cases of small, round, and spindle cells. These cells tend to arrange themselves in groups, and there are other evidences of slow growth. There is generally no evidence of degenerative or inflammatory changes. Usually they are pigmented, although eleven cases are recorded as unpigmented. In eleven cases the growth is said to have arisen from congenital nævus. In six cases only was there any history of previous inflammation or traumatism.

Sarcoma of the iris is one of the rarest of eye lesions. Some men of largest experience have never encountered a case. Still, there have been brought together eighty-three cases in which the clinical diagnosis was confirmed by histological examination. Cases have been observed at all ages, from two to seventy-five years, but they are most common—thirty-four cases—between forty and sixty. In more than half the cases the growth first appeared in the lower segment of the iris.

The first symptom is the growing pigmented tumor, which may exist a long time without other symptoms. Later hyperæmia, alteration of the color of the iris, haziness of the cornea, diminished vision, and increased ocular tension occur and characterize what is called the second stage. In the first stage the sarcoma most closely resembles simple melanoma; but melanoma is stationary, congenital, and usually darker than sarcoma. The two may be differentiated by waiting to see if the tumor grows or by removal and histological examination. Tubercle and gumma begin with inflammatory symptoms, and tubercle is more likely to occur in early life. Gumma may be recognized by the effect of antisymphilitic treatment. In sarcoma the inflammatory symptoms are usually confined to the part of the iris immediately joining the tumor. In gumma and tubercle they are more diffuse. Sarcoma may be multiple, although generally it is not.

The important part of the prognosis is as regards the life of the patient. Safety depends on the early and complete removal of the

¹ Archives of Ophthalmology, July, 1902, p. 323.

growth. Wood and Pusey have especially studied the question as to what constitutes effective removal. Removal by iridectomy, if effective, would preserve the eyeball with commonly useful vision. Five cases are reported, in which this has been followed by no recurrence during periods of four years (Mayweg and Veasey); five years (Kipp); eleven years (Post); "many years" (Little); but in Krukow's case enucleation of the eye had to be done eleven years after iridectomy, and five years after that the patient died of general sarcoma. Of the cases in which enucleation was done, the growth showed limitation to the iris in three and possible limitation to the iris in two; but in forty-one it showed that other parts of the eye were already involved.

Wood and Pusey regard the cases of Little and Post as successes by iridectomy, and Kipp's as a probable success, the patient having been killed by accident five years after the operation. These are all out of the twenty-seven cases in which iridectomy has been done, in which the patient is known to have remained free from recurrence long enough to establish the success of the operation. These facts lead them to this conclusion: "When the diagnosis of iris sarcoma is established the globe containing the growth should be immediately enucleated."

To bring this matter up to date, we may add four cases reported by Meyerhof¹ and two by Rogman.² In all of these cases the growth also extended into the other parts of the eye.

Sarcoma and Related Tumors of the Orbit. Under the heading "Mesoblastic Tumors of the Orbit," Silcock and Marshall³ report nine cases of sarcoma, fibro-adenoma, and possible endothelioma. The known duration of the cases had been from six weeks to ten years. But one patient gave the history of a tumor removed from the orbit thirty-five years previously. He applied for a lump which had been noticed for a year and a half, and had increased rapidly for two or three months. This was removed. Five years and nine months later he returned for a recurrence that had been noticed about two years after the former operation. Again it was removed. Two years and ten months after that he returned again. The tumor had now invaded the superior maxilla and the sphenomaxillary fossa. As much as possible of it was removed. It was found to be a mixed, round, and spindle-cell sarcoma. The patient was not subsequently heard from.

A case somewhat parallel to this is reported by R. J. McKay.⁴ The patient had noticed exophthalmos at the age of ten years. It became greater when she was angry, and subsequently during menstruation.

¹ Klin. Monatsbl. f. Augenheilkunde, December, 1901, and June, 1902.

² Annales d'Oculistique, March, 1902, and January, 1903.

³ Royal London Ophthalmic Hospital Reports, May, 1902.

⁴ Transactions of the American Ophthalmological Society, 1901, p. 247.

At the age of twenty-eight an operation was done. Sixteen years later an irregular nodular tumor began to fill the orbit, and two years after that it was removed and was pronounced by the pathologist to be angio-fibrosarcoma.

In five of Silcock and Marshall's cases the whole contents of the orbit were removed. One of these was known to have died subsequently of recurrence. In the others there had been no recurrence, in two at the end of two years, and in two at the end of three years.

CLEANING OUT THE ORBIT. When the operation of removing the orbital contents is required Silcock and Marshall prefer to do it in the following manner: The edges of the lids, including the Meibomian glands, the hair follicles, and the whole of the conjunctival sac, are separated from the surrounding parts down to the bone. A periosteal elevator is then run around the edges of the orbit, and with this instrument the entire orbital contents are separated from the bone as far back as possible. The optic nerve, together with a small amount of surrounding tissue, is divided as near the optic foramen as possible, and the whole of the orbital contents, including the eye, are removed *en masse*.

As the parts cicatrize the remains of the lids and surrounding skin are drawn into the orbit, which becomes completely lined by skin. If the lid margins and conjunctival sac are left these structures are not only useless, but they leave a mucous discharging surface or cavity at the back of the orbit which is a source of discomfort to the patient. These writers are strongly opposed to the use of caustics, believing it is better to know the full extent of the operation. The deformity after such an operation is necessarily great. The best thing to do is simply to cover the cavity with a celluloid shield.

Great Displacement of the Eyeball. A remarkable case of sarcoma of the orbit has been figured in an earlier volume.¹ In this case there was no sign of recurrence three years later. A case in some respects still more remarkable is reported by Israel.² The patient had noticed protrusion of the eyeball for five years. It was pushed forward 25 mm. and downward 30 mm.; but, although it possessed useful vision and a normal field, there had been no diplopia. The growth was seated in the outer upper part of the orbit, and was found to have caused absorption of the roof of the orbit, a portion 23 mm. long by 14 mm. broad, lying beneath the dura in the cranial cavity. The tumor was removed by Kroenlein's method.³ The eyeball then returned to nearly its normal position, and retained 5/25 vision.

¹ PROGRESSIVE MEDICINE, June, 1899.

² Centralblatt f. prakt. Augenheilkunde, April, 1902.

³ PROGRESSIVE MEDICINE, June, 1902.

PREPARATION FOR PROTHESIS.

Suturing the Tendons with Enucleation. Various plans have been tried of suturing the tendons and conjunctiva after enucleation to secure the greatest mobility for the artificial eye subsequently to be worn. A new one is described by Snell.¹ After dividing the conjunctiva around the cornea, he takes up each rectus tendon on the strabismus hook, and before dividing it, he passes a suture through it which he ties in a loop, securing the centre of the tendon. He cuts one end short and brings the remaining end out through the conjunctiva. After the eyeball has been removed the sutures attached to the internal and external muscles are tied together, "not too tightly." Then the superior and inferior recti are secured in the same way. He has tried sutures of catgut and silkworm-gut, but prefers silk. The color of the one pair of sutures may be different from the color of the other pair. Snell has used this operation in sixty cases, and believes that by it a better and more movable stump is secured.

Protection of the Cornea. Gifford² believes that many sightless stumps are worth preserving, being harmless if protected from infection, and furnishing the best possible support for an artificial eye. The weak point in such a stump is the unprotected cornea, which is liable to be irritated by contact with an artificial eye or penetrated by an ulcer, or to become a channel by infection through a prolapsed iris. These accidents may be prevented by covering it with a conjunctival flap or an epithelial graft from the skin or lip.

From the conjunctival flap he removes the conjunctiva for three-sixteenths of an inch below the cornea. Then he dissects it loose up as far as the upper fornix, where a cross-cut is made to allow the membrane to slide down over the cornea without tension. The edge of the flap thus obtained is sutured to the sclera below the cornea. The stitches must pass into the tissue as deeply as for the advancement of a rectus muscle. Unless this firm attachment is secured the conjunctival flap will be drawn off the cornea.

When the conjunctiva is too much shrunken for the above operation, it is loosened all around the cornea and the cornea thoroughly scraped, especially near its margins. An epithelial flap of sufficient size is then placed on the cornea and its edges slipped under the conjunctiva all around, and both eyes are bandaged for twenty-four hours. When the epithelial flap is taken from the skin the dead epidermis should be

¹ British Medical Journal, November 1, 1902, p. 1430.

² Archives of Ophthalmology, March, 1902.

wiped away once or twice a week to prevent irritation. Such operations are not proposed as substitutes for enucleation or evisceration, but to give a safer stump when removal of the eyeball is not essential.

INJURIES TO THE EYE.

Electric Ophthalmia. The injuries produced by exposure of the eyes to excessive electric light more closely resemble the effects of heat and chemical caustics than they do the effects of excessive functional activity or bacterial invasion which mark other ophthalmias. The results of the direct passage of electricity through the parts, as burns, opacities of the media, etc., are yet more closely allied to mechanical traumatism, and the more remote disturbances of the nervous apparatus without visible lesions may be classed as forms of traumatic neurosis.

Two cases of the ordinary form of electric traumatism are reported by Galezowski.¹ In one the lashes and lid margins were actually burned. In both the usual traumatic conjunctivitis, with intense burning, lacrymation, and photophobia occurred. The patients also complained of central scotoma and annoying after-images.

At the November meeting of the Paris Society of Ophthalmology, Terrien² reported a case characterized by neuralgic pain, visual disturbance, and slight redness of the lids without conjunctivitis. There was slight œdema of the retina, and concentric contraction of the fields for green and white. The œdema of the retina slowly disappeared; the retraction of the field and the reduction of the vision to one-half remained permanent. These cases are of importance in their medico-legal relations. Terrien admits that he could not exclude simulation in his case. Sulzer³ recognizes three kinds of injuries by electric currents: 1. A central chorioretinitis resembling that produced by watching an eclipse with eyes not sufficiently protected. 2. Inflammation of the lids and conjunctiva, due to the actinic rays. 3. Hysterical troubles, due to the fear of serious injury. He has never seen anything like optic atrophy from such an injury.

In discussing Terrien's paper Broca pointed out the relatively large proportion of actinic rays that would reach the eye from the electric arc, formed between metallic poles, as it commonly is in an accidental short circuit, and the large part of the retina that would be exposed to their influence. This renders possible injuries to the retina more serious than those produced by direct sunlight. Morax called attention to the distinction that must be made between the subjective and the objective

¹ *Recueil d'Ophtalmologie*, September, 1902, p. 521.

² *Ibid.*, November, 1902, p. 652.

³ *Ibid.*, December, 1902, p. 710.

symptoms, and that even the latter might be accidental, as the conjunctivitis depending upon the presence and activity of the Weeks bacillus.

Antonelli has found two symptoms which constantly characterize electric ophthalmia. One is conjunctival hyperæmia and cedema without secretion, and the other photophobia and retinal asthenopia.

Galezowski also reports a case in which the effects of such an injury followed by complete blindness were simulated. The nature of the case was revealed by the usual tests of malingering.

For the treatment of these injuries Grimsdale¹ finds cold compresses most effective, and that dark yellow glasses are even better to prevent the accident than those of smoke tint.

Galezowski recommends, in addition to cold compresses and an ointment of cocaine, to spray the eyes for five minutes three or four times a day with the following solution :

Dionin	0.3 gramme.
Sodium bromide	1.0 "
Distilled water	300.0 "

Burns from Lime. These are among the most common of injuries from chemical caustics. They often leave the eye permanently impaired, by the corneal scars and adhesions between the lids and eyeball. The seriousness of the injury is largely proportioned to the length of time the caustic is permitted to remain in contact with the tissues. Prompt treatment is of the highest importance.

Kipp² advises that the patient at once be laid on the floor, the eyelids pulled apart as far as possible, and cold, clean water be poured in a stream over the cornea and conjunctiva until the lime or substance containing it has been washed away. If the spasm of the orbicularis prevents the separation of the lids a solution of cocaine should be injected at the outer canthus with a small, blunt-pointed syringe ; or, if a salve containing a local anæsthetic is at hand, it should be forced between the lids. As soon as the eye can be opened all particles of the caustic should be removed. Kipp points out that the fear of increased temperature through the slaking of the lime is fanciful, that the damage is not due to high temperature, but to chemical action, and that the plain water is better than the solution of sugar sometimes prescribed, because although the latter forms a combination with lime it also is decidedly caustic.

In the line of first help or self help for injuries of this kind, Hoppe³ suggests that workmen exposed to the danger of such injuries should

¹ Medical Press and Circular, April 23, 1902.

² Medical News, October, 1902, p. 635.

³ Centralblatt f. praktische Augenheilkunde, February, 1902, p. 33.

be provided with a salve of holocaine, 20 per cent., in lanolin. This salve may be put up in a gelatin tube or other collapsible tube. The mouth of the tube can be quickly introduced between the lids and the contents rapidly forced into the conjunctival sac. This could be done by any intelligent workman, relieving the pain and largely neutralizing the caustic action of the lime before professional assistance would ordinarily be available.

Burn by Amyl Nitrite. Shumway¹ reports the case of a man who, in attempting to ward off an attack of epilepsy, threw some nitrite of amyl in his eye. A deep burn of the cornea and conjunctiva resulted, with sloughing of the cornea and ultimate loss of the eye. Shumway supposes that by repeated exposures to light and air the fluid had been decomposed, forming nitric and nitrous acid and fusel oil.

Protective Spectacles. When these are needed to guard against excessive light or chemical irritants glass serves the purpose. When there is danger of mechanical force that might shatter glass that material becomes an additional source of danger. Thin plates of mica are less objectionable on this account; but a much stronger barrier to flying particles is proposed by Klauhammer.² He has employed a metal plate through which vision is obtained by such an opening as is used for stenopæic spectacles. This opening may be either circular, two millimetres in diameter, or it may be a horizontal slit, fifteen millimetres long and three-fourths of a millimetre wide. The latter form gives a good horizontal field and particles less than three-fourths of a millimetre thick would very rarely come with sufficient force to do serious injury.

Infected Wounds. In most cases of wound of the eyeball the permanent danger depends upon the accompanying infection. The most extensive lacerations, unattended with serious infection, may leave the eye free from risk of future complications, and sometimes with useful or even perfect sight. But the slightest injury opening the way for grave infection may cause complete blindness and endanger the fellow-eye.

It has long been recognized that disease with suppuration of the lacrymal sac renders the prognosis of an ocular injury much less favorable. Kipp³ urges that in such cases the canaliculus should be slit and kept open by the daily passage of a probe to enable the contents of the sac to escape freely under pressure made upon it at short intervals, and that the sac should be washed out with sterile water or a weak solution of mercuric chloride, or a 20 per cent. solution of protargol.

¹ Philadelphia Medical Journal, October 11, 1902.

² Centralblatt f. praktische Augenheilkunde, September, 1902, p. 271.

³ Medical News, October, 1902, p. 635.

Axenfeld¹ goes further than this. He urges that in laborers and mechanics, among whom the majority of such injuries occur, we should as a matter of prophylaxis generally extirpate the lacrymal sac whenever it is found seriously diseased. These patients usually cannot submit to the prolonged treatment required for the cure of lacrymal obstruction by probing, and unless they are freed from such disease in some way they are in constant danger of the loss or serious impairment of an eye as the result of the slightest injury. He urges the removal of the sac as a routine treatment in such cases, and supports his position by the statistics of 270 cases from his Rostock clinic. His method is to dissect out the sac, generally under cocaine anæsthesia. Other methods of operation were discussed last year.²

But while prophylaxis is most important the surgeon is generally consulted after infection has actually occurred. It is probable that even then many such eyes are lost for lack of intelligent, prompt, and active interference. I have previously referred to the experience of Van Milligen.³ Roscher reports⁴ three cases of penetrating wounds of the eye by bird-shot, a rusty nail, and the kick of a horse, treated in a similar way, by the use of the galvanocautery in the depth of the wound, with excellent results. The method proved equally serviceable in a case of infection following cataract extraction. It is hoped that such efforts to destroy infection will become more frequent; but their successful issue requires that they be made with skill, and the attempt demands a courage or boldness not possessed by all who are called upon to treat such injuries.

CONSTITUTIONAL TREATMENT. For those who shrink from such active operative interference with the eye a recent paper by O. Schirmer, based upon seventy-one cases of infected wounds of the cornea and sclera, offers a definite and comparatively successful plan of treatment. From the value of mercurials in the treatment of sympathetic ophthalmitis and the resemblance of traumatic fibrinous uveitis to that disease, he was led to the energetic and persistent use of mercury in cases of this kind. His plan in every case is to use as much mercury by an unction as the patient will bear, sometimes supplementing this with intramuscular injections. The patient is kept in bed, well fed, and the strictest attention paid to the condition of the mouth. Schirmer finds it important that the mercurial impression should be made early. The results were markedly better in patients thus treated from the first or second day than in those seen only at a later period.

¹ *Münchener medicinische Wochenschrift*, 1902, No. 31.

² *PROGRESSIVE MEDICINE*, June, 1902, p. 401.

³ *Ibid.*, June, 1900, p. 393.

⁴ *Münchener medicinische Wochenschrift*, March 25, 1902.

⁵ *Graefe's Archiv f. Ophthalmologie*, Bd. liii. p. 1.

Schirmer also found that this line of treatment should be continued until the cure is complete and the eye free from redness. In some of these cases, in which the use of mercury was suspended or the dose greatly reduced, soon after decided improvement was manifest, relapses occurred, which required longer periods and more mercury to control than had the original attack. After the subsidence of the inflammation and the stopping of the mercury, potassium iodide is given for several weeks.

Schirmer's cases, the details of which are published in tabular form, show a very remarkable proportion of good results. Ten of the cases were not submitted to this treatment, 5 of them calling for immediate enucleation. Of the other 62, 3 affected with serous uveitis, all recovered with some vision. Of 39 cases of fibrinous uveitis, 12 ultimately required enucleation or resection of the globe, 4 retained the eyeball free from inflammation, but blind, while 23 retained some sight. Of 20 cases of purulent uveitis, 7 came to enucleation and 13 retained the eyeball with vision of more than one-tenth.

Schirmer's results in such a series of cases—retention of a painless eyeball in 69 per cent., with some vision in 63 per cent.—are so good as to constitute a strong argument for the trial of his plan of treatment. But let no one suppose that it consists simply in giving large doses of mercury. This is an essential part of it, but an equally essential part is the good food, rest, and care for the general condition of the patient in every particular. The importance of constitutional conditions in determining the result of such injuries is also emphasized by Hansell,¹ who dwells especially on the unfavorable influences of syphilis, diabetes, and tuberculosis upon the course of healing.

IODOFORM IN THE EYEBALL. Standing midway between the use of the cautery and a dependence on constitutional treatment is a method of disinfecting the wound which should always be borne in mind in treating these cases—the introduction of iodoform into it. Ten years ago Berry² reported a case in which the accidental introduction of iodoform into the anterior chamber was followed by its slow absorption without any bad result. Since then others have reported their experience with it, which was in all cases more or less favorable. Haab, who has previously written upon the subject, still recommends it warmly.³ From his ten years' experience he says: "It cannot do any harm, and certainly very often does good." He uses it in small rods or tablets made with gelatin. These when cut obliquely are easily pushed through a small incision or into a penetrating wound. Care

¹ Journal of the American Medical Association, September 27, 1902.

² Ophthalmological Society, United Kingdom, November 10, 1892.

³ Journal of the American Medical Association, August 30, 1902.

must be taken to see that they are actually pushed within the eyeball, and not merely left in the opening where they will be pushed out again. In evidence of its harmlessness he mentions¹ two cases of tuberculous disease in which vision was perfect after the employment of this method of treatment for more than four months.

Ostwalt employed acacia and glycerin to form the iodoform mass, but has since concluded² that the powder unmixed with any other substance is to be preferred. Wokenius³ reports three cases of grave penetrating wound, two in the ciliary region, and one through the cornea and lens, in all of which some vision was saved under the iodoform treatment. A pellet of the powdered iodoform the size of a pea was introduced through a glass trocar. It was slowly absorbed, requiring several weeks for its complete disappearance.

H. Schmidt,⁴ in a case of commencing panophthalmitis after cataract extraction cleaned out the pus from the anterior chamber and introduced an iodoform disk. The case began to improve at once, and good vision was secured.

FOREIGN BODIES IN THE EYEBALL.

Magnet Extraction. The more general employment of strong magnets is an important fact revealed by the literature of the subject for the past year. It needs to be emphasized, because there are in the hands of the profession, and still offered them, large numbers of electromagnets generally called Hirschberg magnets, which are entirely inadequate for such use. If the piece of steel be very large, the opening through which it is sought to extract it perfectly free, and the tip of the magnet brought in contact with the metal, it is possible that a foreign body will occasionally be extracted by one of these instruments. But for most of the small particles which enter the eyeball they are simply a delusion and a snare. I have more than once seen them fail utterly to bring out a scale of metal that was distinctly visible, and with which the point could be brought in contact.

Haab,⁵ whose name is universally associated with the giant magnet, has reported the results of ten years' experience in its use. He believes that the giant magnet is the only form needed for all classes of cases. But the ability to control the current by the operator's foot so that the action of the magnet may be instantly suspended is important. The patient's eye is placed with the middle of the cornea opposite the point

¹ Corr. Blatt. f. Schweizer Aerzte, 1902, No. 8.

² Annales d'Oculistique, October, 1902, p. 291.

³ Zeitschrift f. Augenheilkunde, August, 1902.

⁴ Ibid., April, 1902.

⁵ Journal of the American Medical Association, August 30, 1902.

of the magnet to avoid drawing the splinter of iron into the ciliary body. The only exception to this position is when it would endanger the previously uninjured lens. With the magnet in this position the splinter is drawn forward around the lens, pierces its suspensory ligament, and causes the iris to bulge.

When this stage is reached the current must be shut off, or the patient's eye pushed away from the instrument. The attempt to draw the foreign body through the iris would be unsuccessful for small particles, and for large ones would result in serious tearing of the iris. The direction of the magnet from the eye is then to be changed, and by care and patience the operator coaxes the splinter into the pupil and forward into the anterior chamber, whence it may be extracted by the magnet or forceps. When the wound of entrance is favorably situated in the cornea, the extraction may be effected through it. Otherwise, it should be through an incision, made with a Graefe knife, in the cornea in front of the iris, yet not too far toward the periphery.

Haab reports an experience of 165 cases. In 134 cases the splinter had passed behind the iris and lens, and in 111 of these, 83 per cent., it was drawn to the front of the iris with the magnet and extracted. The failures were due to embedding of the foreign body in the back of the globe, or its passing back completely through the eyeball; lodgement of the splinter in the ciliary body, either at first or when drawn there by mistake; exudate surrounding the splinter, or its complete healing in, having been embedded for months or years.

The experience with Haab's magnet at the Royal London Ophthalmic Hospital, as reported by MacCallan,¹ includes 34 cases of successful extraction out of 39 in which it was attempted—over 86 per cent. The method of using the instrument and the causes of failure were the same as given by Haab. At the Massachusetts Charitable Eye and Ear Infirmary, Standish² reports seven successes out of eight attempts with the Haab magnet.

But the real success of magnet extraction must be estimated not by the number of iron splinters that are drawn out of the eye, but by the number of eyes that are thus saved from enucleation and the power of vision that they retain. Of Haab's 165 cases 39 ultimately required the removal of the eye; 19 eyes were saved from enucleation but were blind; 71 retained some vision, and he states that 51 of these "healed with good sight." The above, however, include 31 cases in which the foreign body did not penetrate the iris or lens, but was extracted from

¹ Royal London Ophthalmic Hospital Reports, May, 1902, p. 156.

² Journal of the American Medical Association, August 30, 1902.

the anterior segment of the eye—a class of cases having a very different prognosis from those of foreign body in the vitreous.

In MacCallan's cases the foreign body was entangled in the iris in 3, and once in the lens. In the others it was embedded in the vitreous, except in 1 case in which it had passed on through the sclera. Of the 29 cases in which the foreign body was deeply situated, 12 required the removal of the eyeball and 17 retained some vision, 9 having good vision. Of Standish's 7 cases of removal of the foreign body none had come to enucleation, although 2 might subsequently require it; 3 had blind eyes, and 2 seem to have retained some vision.

Combining these figures we find that of 134 cases in which the magnet enabled the operator to remove fragments of iron from the deeper parts of the eye, 38 per cent. subsequently required enucleation; 18 per cent. retained eyeballs that were blind, but which might be retained indefinitely without danger to the other eye, and in 44 per cent. some vision was retained.

These figures compare very favorably with the older reports of extraction with the small magnet, in which only 20 to 30 per cent. of the eyes were saved; but the difference must not be credited entirely to the size of the magnet. Much of it is due to improved intelligence as to its use. MacCallan makes a very interesting comparison between the results obtained with the Haab magnet and those obtained with the small magnet, since careful localization of the foreign body has been accomplished by the use of the X-rays. He reports 18 cases of attempted extraction with the small magnet. There were but 2 failures, or nearly 89 per cent. of successes. In the 16 cases in which the foreign body was extracted the eye was subsequently excised in 3, a blind eye was retained in 1, and in 12 the vision varied from light perception to 6/9.

MacCallan compares the above results with 14 cases of extraction by Haab's magnet after localization. Of these cases 11 retained some vision and 3 came to excision. So far as this number of cases justifies any conclusion, it would appear that the results with the giant magnet and with the hand magnet were equally good, when the position of the foreign body was accurately known before operation; and that in either case they were decidedly better than have been obtained with either the small or the giant magnet without localization of the foreign body.

This matter of the localization of the foreign body is an important one. Haab says it "is chiefly needed when the small magnet is used to bring it into as close contact as possible with the foreign body." Sweet says:¹ "The size of the splinter of iron or steel and its approx-

¹ Journal of the American Medical Association, August 30, 1902.

imate position in the eyeball should be known before an attempt is made to extract it by either the medium-sized or giant magnet." The experience at the Royal London Ophthalmic Hospital, as reported by MacCallan, confirms Sweet's conclusions. It is hard to see why the general principle, that it is better to know all one can about the case before operation, should be suspended when operating with the giant magnet. Certainly the tractive force can be applied with less risk of drawing the particle into some fresh entanglement if the operator knows just where the particle is located to start with.

I believe, too, that in many cases it will be easier and safer to extract through a scleral incision than to attempt to draw the foreign body from the depth of the eye through the pupil. This view is supported by the statistics of Mayweg.¹ He reports 47 cases of extraction through the wound of entrance or a meridional incision in the sclera with the giant or the hand magnet, and 25 cases of extraction through the anterior chamber with the giant magnet. His results, arranged in a single table, are :

Result.	Through sclera.		Through anterior chamber.	
	No. of cases.	Per cent.	No. of cases.	Per cent.
Useful vision	21	45	6	24
Counting fingers . . .	8	17	3	12
Blind eye	11	23	14	56
Eye removed	7	15	2	8

The large proportion of enucleations after extraction through the sclera is probably accounted for by the use of the wound of entrance to remove the foreign bodies from eyes that were extensively disorganized. The explanation for better results from scleral extractions is simple and obvious. Such an operation is attended with removal of infected tissue, and allows more direct drainage of an infected wound. Haab has made much of the importance of leaving the vitreous undisturbed, but experience shows that it is better to disturb it than to leave it infected. Experience with cataract extractions complicated by loss of vitreous and of secondary cataract operations has taught us about what risk attaches to disturbance of the vitreous. It is small in comparison with the risk arising from infection of the vitreous.

A very ingenious way of overcoming one of the accidental difficulties of magnet extraction is described by Kipp.² A spicule of iron 18 mm. long, as afterward measured, had passed into the vitreous, and on the attempt to extract it with the Haab magnet had become entangled in the sclera, and no change in the direction of the eyeball with reference to the magnet dislodged it. In this emergency it occurred to Kipp to

¹ *Klinische Monatsblätter f. Augenheilkunde*, July, 1902.

² *Archives of Ophthalmology*, July, 1902, p. 391.

reverse the poles of the magnet. Whereupon, the splinter of iron, which had now become somewhat magnetized, promptly returned in the vitreous and "shot out of the wound of entrance." The influence of reversing the polarity was, in this case, unusually great, because of the long, slender form of the splinter; but it might be of practical value even though the effect were not so striking.

Another practical point which may be found valuable in certain emergencies, especially when using the giant magnet, is the placing of a steel instrument in contact with the magnet tip, and also in contact or close apposition with the foreign body, and thus extracting a particle so embedded or wedged in as not to leave its position in the eye under the influence of the magnet as ordinarily used. Thus, Milliken¹ introduced

FIG. 46.



Volkmann's magnet.

the blades of fixation forceps within the wound and brought the other end of the instrument in contact with the magnet. Cofler,² in order to ensure the removal of a minute particle of steel embedded in the lens, pierced the lens capsule with a keratome, which he then connected with an electromagnet, and thus brought out the minute foreign body.

FORM AND STRENGTH OF MAGNETS. The electromagnets hitherto used to extract particles of iron from the eye have been of one general form—a comparatively short core, thickly wound with wire to carry the exciting current; and the stronger magnets have been relatively

¹ Cleveland Journal of Medicine, July, 1900.

² Annals of Ophthalmology, July, 1902, p. 581.

shorter and more thickly wound. Volkmann¹ points out that such magnets are comparatively heavy and wasteful of current for the force they exert. He proposes the form shown in Fig. 46.

These he has made of different sizes. The largest, weighing 25 kilogrammes (55 pounds), has a length of 95 cm. (38 inches), and its greatest diameter is 11 cm. (4½ inches). The core is most thickly wrapped near the end which is to be presented to the eye. For the large magnets the core terminates in a flat end, a hemisphere as shown in the figure, or a conical point. For the smaller ones tips are added that can be introduced within the eye.

Volkmann points out that with any form the power of the magnet does not increase in proportion to its weight. Thus, to increase the power three times he had to increase the weight nine times. Even apart from this the relative strength of two magnets will vary greatly with differences of distance from the particle attracted. With a splinter of iron in contact with the tip a hand magnet of very moderate power may exert more tractive force than the giant magnet, its tip also in contact with the particle. In general, the superior power of the large magnets disappears when brought comparatively close to the foreign body. Türk² found that with a splinter in contact with the tip the attractive force of the Haab magnet was 16.7, and of the Hirschberg 13.7, although at a distance of 1 cm. the former exerted an effect more than 1000 times greater than the latter.

Sweet, who has devised a magnet of moderate size, weighing about ten pounds, found that for moderate distances—2 to 5 mm.—the tractive force of his magnet was greater than that exerted by the magnet of Haab, although at a distance of 25 mm. it was only from one-fifth to one-half as great. Even the form of the pole presented to the eye powerfully influences the relative power of the same magnet for different distances. Thus, Volkmann found that with his magnet the relation of the power of the hemispherical pole to that of the conical pole was, at 5 mm., 108 to 320; at 1 cm. it was 50 to 59; at 2 cm. it was 16 to 11.2, and at 3 cm. it was 7.3 to 4.3.

CHOICE OF MAGNET. From what has been said it will be evident that among the large number of magnets offered for the extraction of bits of iron from the depth of the eyeball no one is best for all cases. Perhaps a magnet cannot be too strong for the purpose, but it may be unnecessarily large, expensive, and cumbersome. Or it may require a current for its operation which is not generally available.

When there is no means of knowing the location of the foreign body

¹ *Klinische Monatsblätter f. Augenheilkunde*, February and May, 1902.

² *Archives of Ophthalmology*, March, 1902, p. 141.

the giant magnet of Haab, with a flat or rounded pole, will prove most efficient; but when the conditions are slightly different this superiority disappears. As Risley¹ says of the magnets of medium power: "It remains to be seen whether a more extended experience will not demonstrate that these instruments, when employed in conjunction with our modern means of determining both the size and exact location of the metallic body, are to be preferred to the giant magnet in the routine of practice because of their portability, practical efficiency, and greater safety." The same view is held by de Schweinitz.² Certain it is that one need not hesitate about using such a magnet—as those of Sweet, Johnson, or Volkmann's No. 2 or 3—from any feeling that it is greatly inferior to the giant magnet, for with the pole of proper form, brought within a semi-diameter of the eyeball from the foreign body, such inferiority of power is very slight.

FOREIGN BODIES NOT INFLUENCED BY THE MAGNET. In a case in which numerous small particles of antimony sulphide were embedded in the cornea, Columbo³ reports the successful use of electrolysis. The positive pole was applied to the back of the neck and the negative pole over the eye through cotton saturated with physiological salt solution. The electrolytic action converted the compound of antimony into a soluble chloride, which was easily disposed of.

For the removal of non-magnetizable foreign bodies from the depth of the eye, Haab⁴ recommends the use of the Desmarres capsule forceps if the position of the foreign body be definitely known. When the position is not known he advises against any attempt at its removal. In these cases everything depends on localization. Weber⁵ reports the case of a splinter of steel, three-quarters of an inch long, lodged in the vitreous. It could be seen with the ophthalmoscope, and was removed with iris forceps through an incision made in the sclera, over the point where one end of the splinter rested. The eye retained good vision a year afterward—a result as good as could have been hoped for after magnet extraction.

Foreign Bodies Long Retained in the Eye. Occasionally a case is reported in which a foreign body has long been retained within the eyeball without causing any serious lesions. Thus, Marbourg⁶ reports a case in which a particle of steel was lying in the anterior surface of the iris fifteen years after the time it entered the eye. It had caused

¹ Transactions of the American Ophthalmological Society, 1902.

² Ophthalmic Record, November, 1902, p. 609.

³ Recueil d'Ophthalmologie, November, 1902, p. 667.

⁴ Journal of the American Medical Association, August 30, 1902.

⁵ Ibid., October 18, 1902, p. 987.

⁶ Ophthalmic Review, December, 1902, p. 654.

no reaction, and the patient refused to have it removed. Such cases might be supposed to throw doubt upon the propriety of always attempting the removal of a foreign body when the case is seen shortly after its entrance; but when they are followed to the end they confirm it.

Chance¹ reports a case in which the eye had remained quiet for twenty-six years after the injury, but after a second comparatively slight injury it became disorganized, and on removal a metallic foreign body was found embedded in the retina. The presence of the apparently harmless foreign substance had rendered a slight injury fatal. Maire² reports a case in which a small sliver of wood, after remaining thirty-eight years in the atrophic globe, set up sympathetic irritation, which rendered enucleation necessary. Dodd³ reports a case in which a piece of nutshell had penetrated the globe, and remained for thirty years without causing trouble. Then without known cause, except possible cold, the eye became inflamed and very painful, and sympathetic irritation occurred. After enucleation the foreign body was found enveloped in connective tissue. These cases fairly represent the leading characteristics of their class. Although for a time seeming to disprove the need for prompt removal, they ultimately show on what a firm foundation the common teaching with regard to such foreign bodies is based.

Eyelash in the Anterior Chamber. A case of removal of an eyelash from the anterior chamber is reported by Dunn.⁴ The lash was forced in by a piece of steel which wounded but did not enter the eyeball, and the wound was healed completely within two days. From the difficulties encountered in this case Dunn concludes that the incision for the removal of such a foreign body should be large, and should be placed opposite the middle of the lash, and that a flexible hook is the best instrument for its extraction.

Chestnut-bur Injuries. For the spines of a chestnut-bur embedded in the cornea so deeply that any manipulation was likely to push them against the iris and lens, Meding⁵ employed the following treatment: The eye was kept under atropine and at rest, and at the end of a month three of the spines were found so loosened that they could be extracted with forceps. At the end of a second month two more were extracted. After six weeks longer the others—there had been eight in all—had entirely disappeared. The resulting opacities were almost imperceptible, and vision of 20/20 was retained. Kipp,⁶ who has often seen these injuries, has always removed the spines very carefully and has

¹ Ophthalmic Review, March, 1902.

² Ibid., July, 1902, p. 409.

³ Ibid., April, 1902, p. 220.

⁴ Archives of Ophthalmology, May, 1902, p. 214.

⁵ Ibid., November, 1902, p. 545.

⁶ Medical News, October 4, 1902.

never seen serious consequences follow the accident. More serious results from such injuries and a more aggressive treatment for them have been previously referred to.¹

INJURIES NOT DIRECTLY INVOLVING THE EYEBALL.

Wounds of the Optic Nerve. Birch-Hirschfeld² reports two new cases of such injury—one by the prong of a pitchfork and the other from the explosion of a hydrant valve. He also presents in tabular form the principal facts with reference to forty-four cases that have previously been reported.

He divides these cases into two general classes. The first includes those in which the circulation in the retinal bloodvessels was not interrupted. Of these thirty-three have been collected from the literature, and with them his cases belong. The other class includes those in which the injury has involved the central retinal vessels. Of these there are eleven. In the first class several cases retained vision in some part of the field, varying from light perception to 1/10, although the majority were completely amaurotic. In the second class all vision was lost in each case. In every case an ophthalmoscopic examination after a sufficient interval revealed more or less optic atrophy. But in many of the cases of the first class at the first examination no abnormal appearance of the ocular fundus was discovered.

Injuries of this kind are of practical interest, chiefly in regard to the prognosis. If the character of the injury can be recognized it can safely be predicted that the vision will not be restored. The impairment must generally occur at the instant of injury; but because it has been masked by other symptoms or because of the hope that it is only temporary these patients sometimes delay many days or weeks before seeking professional advice. In some cases the injury has been fatal. In one of them death was due to tetanus.

Shot Wounds of the Orbit. Panas,³ discussing injuries of this sort, calls attention to the tolerance of grains of shot in the tissues, and points out that they must be comparatively aseptic. Thus, among fifty-two cases only four required enucleation, although in many of them shot had passed through the eyeball or remained within it. In view of this Panas urges conservative treatment—the use of antiseptic washes, iodoform, rest, and immobility of the eye under a compress bandage; atropine for iritis, and the abstraction of blood from the temple to con-

¹ PROGRESSIVE MEDICINE, June, 1900, p. 393.

² Klinische Monatsblätter f. Augenheilkunde, May, 1902.

³ Archives d'Ophthalmologie, March, 1902.

trol pain, with calomel, quinine, and acetanilid internally. Enucleation is to be done only when prolonged inflammation of the uveal tract indicates a risk of sympathetic ophthalmia.

Injuries during Birth. A case of palsy of the sixth and seventh nerves, following a difficult forceps delivery, is reported by Nettleship.¹ It had been a brow presentation in a small pelvis. One blade of the forceps had left a mark in the right mastoid region, and the other was on and in the front of the left ear. Inability to close the right lids and strong convergence of the right eye were noticed almost immediately after birth. On the fifth day a single hemorrhage was found in the right fundus below the optic disk. At the end of one month there was great improvement, and at the end of nine months there remained only a slight defect in the action of the orbicularis oculi and in the movement of the angle of the mouth. Nettleship believed the lesion was a hemorrhage involving either the nuclei or the nerve trunks where they lie near together on the petrous bone. In discussing the case Fisher thought that the injury to the sixth nerve might have been by hemorrhage; but that the seventh was probably subjected to direct pressure of the forceps where it emerged from the skull.

Snell² has seen within the year two cases of injury by the forceps. In one the eyeball had been forced out of its socket and hung out on the cheek by bands of conjunctiva with an inch of optic nerve still attached to it. In the second case a part of the conjunctiva hung between the lids and finally sloughed, but the eyeball escaped.

Koppen³ reports a case of atrophy of the optic nerve and microphthalmos of the left eye, which he ascribes to injury during birth. Delivery had been difficult and with instruments, and the eye was noticed immediately to protrude strongly with evidences of hemorrhage about it. Subsequently it had been operated on for strabismus. When the patient was examined, at the age of nineteen years, the optic disk was white; the vessels, particularly the arteries, narrowed; the field restricted, and vision reduced to counting fingers at two or three metres. The diameter of the cornea was $1\frac{1}{2}$ mm. less than that of the right eye. Injuries of this kind are not common, but their occurrence should be borne in mind, both as a reason for caution in instrumental delivery and as an explanation for defects of the eye which may date from birth.

¹ Transactions of the Ophthalmological Society of the United Kingdom, October, 1902.

² Ophthalmic Review, January, 1903, p. 28.

³ La Clinique Opthalmologique, December, 1902, p. 353.

ESTIMATION OF DAMAGE FROM OCULAR INJURY OR DISEASE.

The Estimation of Damages, Insurance Benefits, and Pensions for Impaired Vision has heretofore been quite arbitrary. The pensions for a few disabilities have been fixed by law. The price to be paid for certain injuries, as loss of an eye, have been specified in the contracts of insurance companies. But monetary damages attaching to other forms and degrees of visual impairment and the rates of compensation arrived at by suits at law have been entirely without relation to any generally acknowledged rule or principle of computation.

Würdemann¹ claims that "for all wage-earners the economic damage after accidental injuries affecting the vision may be estimated by a scientific examination and calculation." He and Magnus,² in a journal article and later in an elaborate monograph,³ have undertaken to develop and show the manner for using a general mathematical formula by which such calculations can be made. Their formula is one in which all the factors are variable, and only the relation between them is assumed to be fixed, and even to these fixed relations they recognize the possibility of individual exceptions. While economic damage or loss of earning power is not the only thing to be considered, they hold it should be the basis for estimates of compensation, insurance benefits, pensions, etc. After the loss of earning power has been determined the courts may consider the value of such things as pain, personal appearance, reputation, etc.

These authors regard earning power as a product of (1) functional power; (2) technical knowledge and skill; (3) ability to compete in the labor market; and they think that the economic value of the technical knowledge and skill depends on the visual power with which they are united. For the majority of trades and professions they hold "earning ability" is economically synonymous with "visual earning ability." For the estimation of economic damages from impairment of vision they consider such impairment as it affects one or more of these three factors—central acuteness of vision, the visual field, and the ocular movements.

ACUTENESS OF VISION. For acuteness of vision we have exact mathematical expressions in common use; but for its economic relations different standards have to be recognized from those accepted in ophthalmic science. Magnus and Würdemann divide all trades and profes-

¹ American Journal of Ophthalmology, August, 1902.

² Annals of Ophthalmology, April, 1901.

³ Visual Economics, Milwaukee, 1902.

sions into two groups—one requiring a higher the other a lower degree of visual acuity. For the first group they find that a person with only 75 per cent. of normal vision (scientific standard) still possesses full earning power. He is counted as having full economic vision. On the other hand, when his vision falls to 15 per cent. (scientific standard) he is totally disqualified for these particular professions or trades—that is, by the economic scale his vision is 0. For the occupations requiring the lower visual acuity it is found that one who possesses 50 per cent. of normal vision (scientific standard) still has full earning ability—that is, his economic vision is 1. But when his vision falls to only 5 per cent. of normal (scientific standard) his earning ability is totally destroyed ; his economic vision is 0.

Among those following the occupations requiring the higher visual acuteness are students and members of the professions, skilled mechanics, textile workers, printers, railway and steamship employés, soldiers, sailors, and skilled labor generally. Among those requiring only a lower degree of visual acuteness are included workers in mechanical industries, quarrymen, mine laborers, farmers, porters, and unskilled labor generally. But different individuals, following the same general occupation, do not have the same visual demands made upon them. This must be remembered, and the particular kind of work that the individual was doing, or was capable of doing, must be considered with reference to the standard of visual acuity it requires. Possibly it may in future be necessary to recognize additional economic standards. Some of the railroads now require normal by scientific standard of new employés. Whether such additional standards will be advisable or not will appear when the valuable and suggestive standards above defined have been generally recognized and employed.

Estimated on this basis of the two standards set up by Magnus and Würdemann, the effect of different degrees of visual acuteness upon the earning ability is indicated in the following table :

Scientific standard. Per cent. of normal vision.	Occupations requiring higher visual acuity.		Occupations requiring lower visual acuity.	
	Earning power.	Economic vision.	Earning power.	Economic vision.
1.00	1	100 per cent.	1	100 per cent.
0.95	1	100 "	1	100 "
0.90	1	100 "	1	100 "
0.85	1	100 "	1	100 "
0.80	1	100 "	1	100 "
0.75	1	100 "	1	100 "
0.70	11/12	91 "	1	100 "
0.65	10/12	83 "	1	100 "
0.60	9/12	75 "	1	100 "
0.55	8/12	66 "	1	100 "
0.50	7/12	58 "	1	100 "
0.45	6/12	50 "	8/9	88 "
0.40	5/12	41 "	7/9	77 "
0.35	4/12	33 "	6/9	66 "
0.30	3/12	25 "	5/9	55 "
0.25	2/12	16 "	4/9	44 "
0.20	1/12	8 "	3/9	33 "
0.15	0	0 "	2/9	22 "
0.10	0	0 "	1/9	11 "
0.05	0	0 "	00	0 "
0.00	0	0 "	00	0 "

DEFECTS OF THE FIELD OF VISION. These are graded by Magnus and Würdemann as follows :

1. Concentric contraction of the field of one eye, or absence of the temporal half, leaves a fractional value of $\frac{5}{6}$ for the remaining field, and reduces the earning ability about 10 per cent. (9.542).

2. For concentric contraction of both fields to 60° or absence of the temporal halves of both fields, the remaining fractional value is $\frac{2}{3}$, the impairment of earning ability 20 per cent.

3. Homonymous hemianopsia. Fractional value $\frac{1}{2}$; impairment, 32 per cent.

4. Concentric contraction of both fields, reaching to 30° ; fractional value $\frac{1}{3}$; impairment, 45 per cent.

5. Concentric contraction of both fields to 5° reduces the earning capacity to 0.

6. Loss of the nasal half of one or both fields does not impair the earning ability.

Central scotoma seems not to figure in their calculations, except in so far as it means a reduction of visual acuity.

IMPAIRED OCULAR MOVEMENTS. Any impairment of the ocular movements which prevents the two eyes from working together in binocular vision is held by Magnus and Würdemann to be equivalent, in an economic sense, to the complete loss of one eye. If, however, a person has only monocular vision to start with, the paralysis of one of

the ocular muscles is practically a small matter. They regard the six extraocular muscles as having generally equal values. So that the paralysis of each of them reduces the earning ability of a person with monocular vision by $1/6$. But they point out that for certain occupations the value of different muscles is not equal, and this must be considered in estimating the earning power.

LOSS OF ONE EYE. The impairment of earning power which this entails has been quite variously estimated in the past. Sometimes it has been placed at one-half. In the German insurance office it is estimated at one-third. But inquiry among iron and steel workers showed that the diminution of wages earned was actually not more than 26 per cent. Maklakoff¹ found that among factory operatives in Russia with few exceptions those who had lost an eye did as good work and earned as much wages as their fellows. The disability from such an injury is greatest immediately after its occurrence. Later much of the uncertainty and awkwardness it entails disappear. Magnus and Würdemann find that for the occupations requiring higher visual ability the loss of an eye causes about the following percentages of impairment: For the first year, 31 per cent.; for the second year, 21 per cent.

For occupations demanding less of vision, the impairment for the first year would be 27 per cent., and after that 18 per cent. When the vision of one eye is lost gradually, the effect from the start is practically the same as it would be after the first year, from sudden loss of one eye.

For the complex problems which arise in connection with injuries affecting the two eyes unequally, or eyes previously differing in their visual powers, these authors have furnished definite schemes for estimating damages which cannot be here considered. Their methods are doubtless capable of improvement; but it is a great advance to have a method of any kind introduced where heretofore it has been entirely lacking.

ABILITY TO COMPETE. Under this heading Magnus and Würdemann bring in certain facts which, if not strictly a scientific part of ophthalmology, are of great practical importance in estimating damages. The ability to compete depends not only upon what one can do with his eyes, but also upon what others, as possible employers, think he can do with them. A person with an obviously damaged eye, as one with extensive corneal leucoma, or a high degree of strabismus, will find it more difficult to get work than one whose real visual ability may be no greater, but whose defect is less obvious.

¹ Roussky Vrach, March 9, 1902.

It is clear that this impairment of ability to compete will be much greater in certain lines of work, than in others requiring the same or even less visual acuteness, and it will vary with the individual case. To meet this, in their mathematical formula Magnus and Würdemann introduce the ability to compete, as a root, with a variable exponent, to which can be assigned such a value as the particular case seems to require.

INFLUENCE OF AGE ON PECUNIARY LOSS. The total loss which a certain impairment of earning power entails must depend upon the length of time such earning power could be exercised. In the assessment of damages for injury the age of the patient must be considered. The problem to be solved is: To what extent have the probable total earnings of the individual been diminished? A laborer or artisan having reached a certain grade is not likely to obtain any higher wages. But after a certain period his efficiency will diminish and he cannot be expected to earn as much. On the other hand, Hansell¹ has pointed out that with unimpaired powers a professional or business man could be expected to double his income every ten years. It is assumed that earning power begins at fifteen years and continues to sixty-five, and for other than business and professional men it is assumed that after fifty the earning power will be reduced 25 per cent. In estimating thus the future loss, however, it is pointed out that the ambitions and hopes of the individual cannot be taken into account. The basis must be the kind of work he is fitted for, or doing at the time of injury, and the compensation he has been receiving. Neither can the formulas proposed be applied in the case of children or others who are not wage-earners.

Perhaps the most serious defect in the formula of Magnus and Würdemann is in the direction of failure to fully consider the ability of a worker disabled for one occupation to take up another. This possibility is enlarged upon by Braunstein.² But I cannot accept his view that any mathematical formula is worthless and misleading.

The above meagre outline of the plan of estimating visual damages has seemed worthy of insertion here, because it brings out the leading problems to be solved and the methods adopted for their solution by those who have given most attention to the matter. Even though one cannot fully accept these methods or wholly agree to the assumptions on which they are based, he must find the careful consideration of them a valuable help in any attempt to solve the problems in his own way.

¹ *Annals of Ophthalmology*, October, 1900.

² *Roussky Vrach*, December 7, 1902.



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